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THE MARINE OBSERVER

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CONTENTS

Page

Editorial **162**

The Marine Observers' Log — October, November, December **166**

The Cryosphere — a view from the Ice Bench.
By A.P. Maytham **178**

The Longitude Man. By M. Moore **189**

Meet the Port Met. Officers **193**

Pressure gradients in the North Pacific **196**

Aurora Notes October to December 1992. By R.J. Livesey **198**

Letters to the Editor **199**

Personalities **200**

Meteorological Office Staff **202**

Port Met. Officers overseas **203**

Index **207**

COVER PHOTOGRAPH: Glaciating cumulonimbus cloud in the western Pacific Ocean between Taiwan and Luzon, photographed from the *Baltic Breeze* on 15 July 1992 by Captain L.K. Huat.

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LONDON: HMSO

Editorial

Safety at sea — tankers

We who have spent the majority of our working lives observing with respect the ways of the sea and the continuing disasters that occur upon it, are well aware of the problems that can beset ships, even comparatively new ones. It was therefore with increased regret that we learnt of the collision and decimation by fire of one of the better observing ships, *British Trent*, last June, whilst Lord Donaldson's Inquiry into the implications for coastline protection measures following the grounding of another tanker, *Braer*, was still under way. *British Trent*'s Master, Captain Stan Montague, was personally known to us and our heartfelt sympathy goes to him and to the relatives of the officers and crew members who died in the blaze. Our own tribute to those who perished appears in the Personalities section of this edition.

Ever since the first major European oil spill, that of the *Torrey Canyon*, lessons learnt do not always seem to have been heeded. Efforts to support positive, internationally concerted action to prevent further disasters were overtaken by the grounding of the *Amoco Cadiz*. When the news came of a large tanker causing massive pollution damage to the French coastline, following the ship's steering gear failure, it apparently caught the authorities and the general public unawares.

The two most recent incidents occurred whilst the tankers concerned were sailing legitimately in international waters: enough has already been written about the *Braer*'s engine breakdown and foundering on Shetland's rocky shore. Even though the ensuing pollution and environmental damage was not apparently as disastrous as was first feared, regulation of tanker routeing around the United Kingdom coasts must surely be an urgent necessity.

Our Marine Superintendent has for many years co-operated closely with the authorities concerned, in connection with the effects of all weather- and current-related matters affecting ships' routeing. He was involved from the start with the necessarily protracted debate over the years on arrangements which lead to the introduction of the Global Maritime Distress and Safety System. Minor teething troubles and the problem of adapting to new communications equipment and methods aside, increased safety at sea should inevitably result from the introduction of the GMDSS.

Most recently he was accompanied by the Manager of the Met. Office Marine and Legal Consultancy Service, in attendance at Lord Donaldson's Inquiry. The terms of reference of this inquiry were 'To advise on whether any further measures are appropriate and feasible to protect the U.K. coastline from pollution from merchant shipping. Due consideration should be given to the international and economic implications of any new measures.' Among several questions raised at this public inquiry was the issue of insufficient time allocated by the BBC to do full justice to shipping bulletins broadcast by radio. When talking of the depth of information that needs to be provided for the mariner, the Marine Superintendent was at pains to remind the inquiry that U.K. shipmasters received training in marine meteorology on which they were examined for their Certificates of Competency.

The Marine Superintendent also reminded the Donaldson Inquiry that prior to GMDSS there was no obligation for ships to receive meteorological warnings or forecasts. However, in Chapter IV, Regulation 12, paragraph 2 of the 1990 amendments to the *Safety of Life at Sea Convention* (SOLAS for GMDSS) it

states that 'every ship while at sea, shall maintain a radio watch for broadcasts of maritime safety information ... and since MSI includes meteorological forecasts and warnings, there is now an obligation on shipmasters to record on board forecasts and warnings.'

From the U.K. standpoint the move of the headquarters of the Surveyor General's Organisation of the Department of Transport to a new headquarters, and the consolidation of the various marine emergency organisations on one site in Southampton, can only help to improve response time and efficiency, together with the Marine Emergencies Organisation of the Department becoming an Executive Agency in April 1994. The MEO consists of Her Majesty's Coastguard and the Marine Pollution Control Unit. HMCG is responsible on behalf of the Secretary of State for Transport for meeting the U.K.'s international commitments to maintain an adequate and effective search and rescue organisation within the country's maritime search and rescue region, and to respond to reports of people in distress on the U.K. coastline. The MPCU is responsible for protecting the marine environment and minimising damage to U.K. interests from pollution by maintaining an effective and efficient response organisation for the clean-up of oil and chemical spills resulting from shipping casualty pollution incidents.

Marine Superintendent honoured at CMM–XI

During his attendance at the eleventh quaternary session of the World Meteorological Organization's Commission for Marine Meteorology at Lisbon last April, Captain Gordon Mackie, Met. Office Marine Superintendent, was honoured with a certificate for outstanding services to WMO.

Following a recommendation of the 1991 Meeting of the Presidents of Technical Commissions concerning the formal recognition of outstanding services by individuals to the activities of specific technical commissions, certificates of outstanding service were awarded to a number of representatives.

Photograph by courtesy of WMO

Captain Mackie receiving his certificate for outstanding services from Mr G.O.P. Obasi, WMO Secretary-General, with Dr Lim Joo Tick of the Malaysian Meteorological Service, Vice-President of CMM, looking on.

The citation reads thus:

'Certificate for outstanding services to the World Meteorological Organization and particularly to the WMO Commission for Marine Meteorology presented to CAPTAIN G.V. MACKIE in recognition of his outstanding leadership in the provision of meteorological services to the mariner, including in particular the preparation and implementation of the new global WMO Marine Broadcast System, his invaluable liaison work on behalf of WMO with IMO and INMARSAT and his substantial contributions during three sessions of the Commission.

In the name of the World Meteorological Organization.'

Proposed modifications to SHIP code

One of the items on the Commission agenda concerned requirements for reporting codes. CMM took up recommendations on proposals from CMM Sub-group on Marine Climatology for modification to the SHIP code, to improve marine data availability and quality for climate purposes.

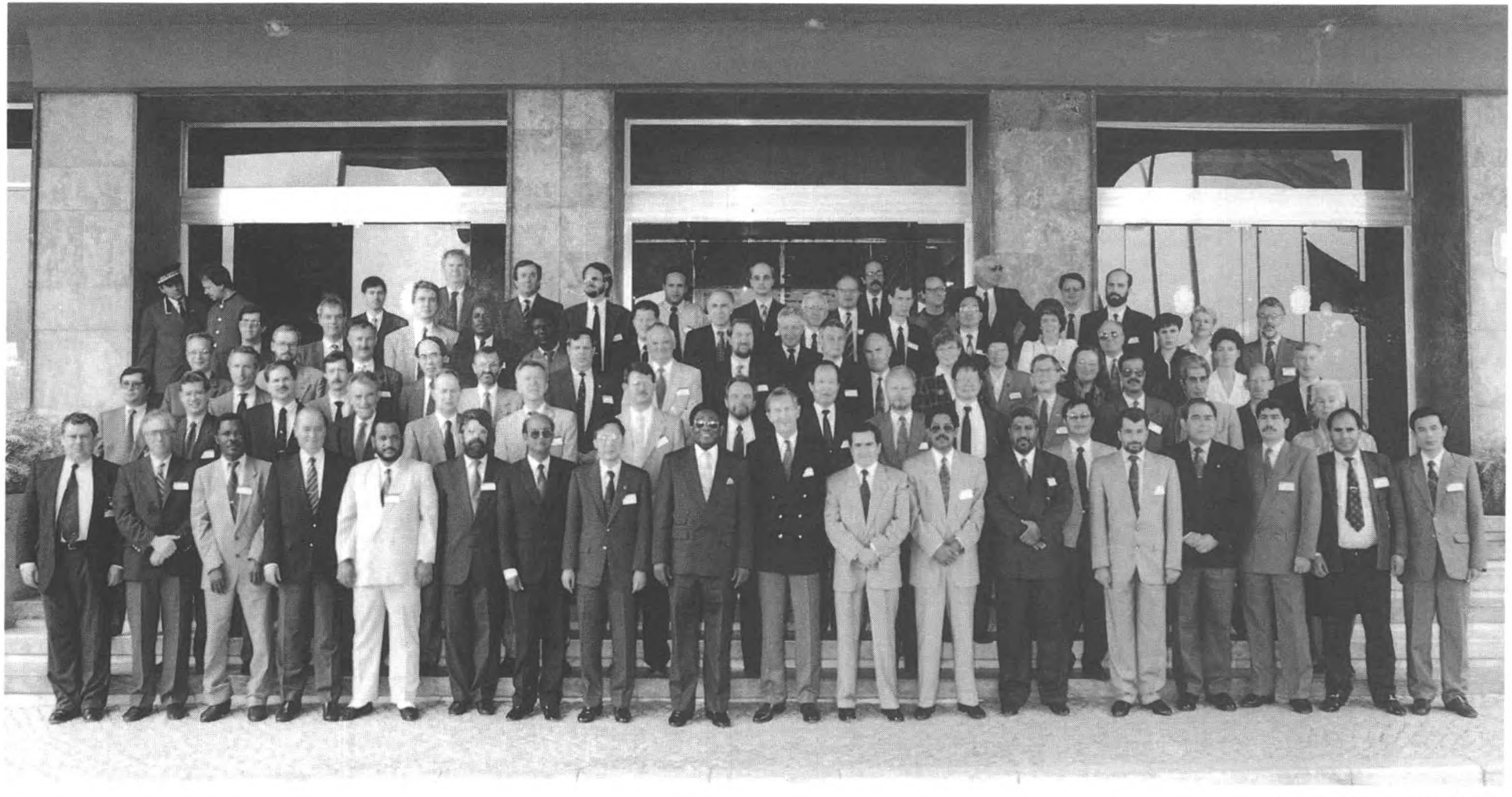
Specifically:

(a) Addition of a group for reporting wet-bulb temperature.
(b) The systematic reports of all present weather, past weather, cloud and wave groups for all meteorological and sea state conditions.
(c) An indicator for the type of measurement of sea surface temperature. (This will be incorporated in a modified code table for sign of [sea] temperature.)

The implementation date for these proposals is 2 November 1994. The necessary changes will be incorporated into forthcoming reprints of Marine Division publications.

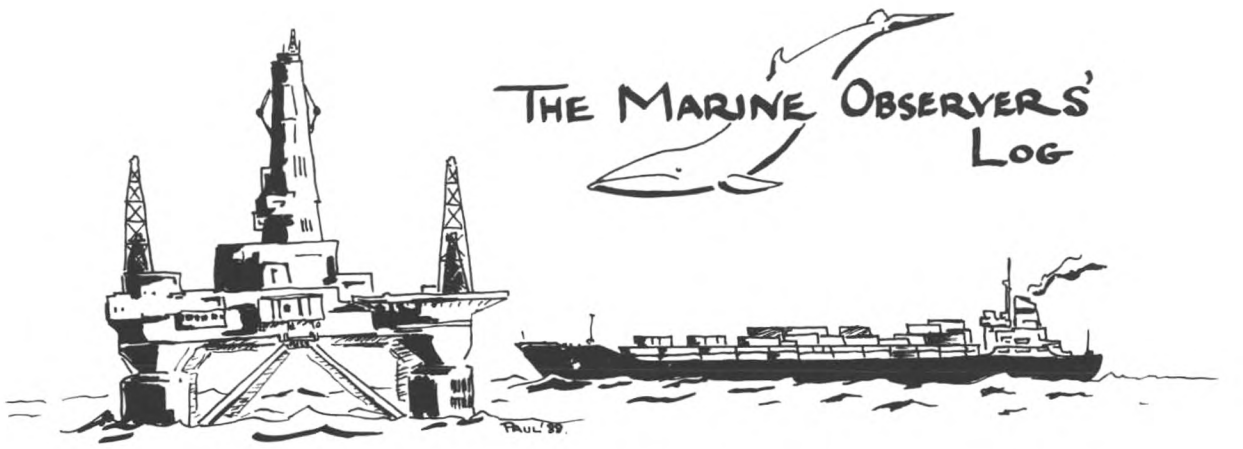
The Commission also urged Members to make every effort to recruit additional members to the world fleet of Voluntary Observing Ships, in particular in data-sparse areas. Quality and availability are of equal importance to quantity in terms of their value to both operations and research.

J.F.T.H.



Photograph by courtesy of WMO

National representatives attending the eleventh session of the WMO Commission for Marine Meteorology at Lisbon, April 1993.



October, November, December

The Marine Observers' Log is a quarterly selection of observations of interest and value. The observations are derived from the logbooks of marine observers and from individual manuscripts. Responsibility for each observation rests with the contributor. The standard international unit for barometric pressure is the hectopascal (hPa) which is numerically equivalent to the millibar (mb).

DEPRESSION

North Pacific Ocean

m.v. *Aya II*. Captain M.W. Slayman. Juan de Fuca Strait to Tokyo Bay. Observers: the Master and ship's company.

17–20 October 1992. The vessel was clear of Juan de Fuca Strait at 1430 UTC on the 17th, and at 1740 the course was altered for Unimak Pass. At this time the wind was ESE'ly, force 4, the pressure was 1021.2 mb and the sea was slight with a low swell.

At 1700 the forecast had indicated a depression in position 50°N, 143°W, with a central pressure of 991 mb and moving north-eastwards at 15 knots before turning north and slowing. Around 1800 the pressure started to fall as rain commenced and the wind increased. The following observations are extracts from the vessel's deck and meteorological logbooks.

Date and time	Wind Dir'n	Force	Dry bulb (°C)	Pressure (mb)	State of sea/swell	Remarks
17th 1900	ESE	6	10.0	1018.7	Rough/Moderate	Vessel rolling and pitching moderately at times.
2300	SE	8	11.5	1011.9	V. rough/Moderate to heavy	As above. Overcast with drizzle.
18th 0300	SE×S	9	11.2	1003.5	V. rough/Heavy	As above. Overcast with continuous rain.
0700	SSE	8	11.5	995.1	V. rough/Heavy	As above.

At 0930 the rain ceased and, with the wind now SW'ly, force 5/6, the pressure fell more slowly. During the next four hours the wind decreased to force 4, but at

1800 the forecast was for a developing storm in 48°N, 146°W, pressure 972 mb, moving north-eastwards at 30 knots before turning north-westwards and weakening. The following observations were made during the 19th.

Date and time	Wind Dir'n	Force	Dry bulb (°C)	Pressure (mb)	State of sea/swell	Remarks
19th 0000	SW	6	11.0	986.6	Rough/Heavy	Vessel rolling and pitching moderately. Overcast with continuous rain.
0400	E×N	8	9.5	973.3	V. rough/Heavy	As above.
0800	S×E	6	11.0	965.8	V. rough/Heavy	As above.
1000	N×W	8	—	963.0	—	Minimum pressure reached.
1045	NW×N	10	—	—	—	Showers, then rain.
1200	—	—	—	—	—	Position of storm 54° 30′N, 140° 06′W.
1300	NW	8/9	8.0	966.7	V. rough/Heavy	Condition of vessel as for 0000.
1700	WNW	9	6.5	970.2	V. rough/Heavy	Rolling and pitching heavily at times. Continuous rain.
2100	W×N	8	5.5	976.8	V. rough/Heavy	As above.

Conditions remained similar until 0200 on the 20th when the wind started to abate. The vessel continued on its track to Unimak Pass, but on the 21st while some miles away, the vessel altered course to pass south of the Aleutians to get shelter from the N'ly winds blowing from the storm which was turning towards the Gulf of Alaska in a north-westerly direction.

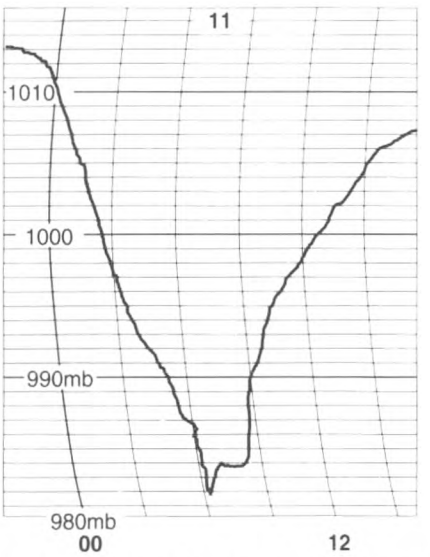
Position of ship at 1230 UTC on the 19th: 54° 00′N, 142° 45′W.

English Channel

m.v. *Pride of Hampshire*. Captain M.L. Bechley. Le Havre to Portsmouth. Observers: the Master, Mr N.J. Carter, 2nd Officer and Mr S.A. Telford, 2nd Officer.

11 November 1992. Throughout the day an intense area of low pressure tracked across southern England and into the Continent. The following observations were made during the period, and the barograph trace shows the pressure changes experienced.

Date and time (UTC)	Wind Dir'n (°)	Speed (kts)	Pressure (mb)	Visibility (n.mile)	Remarks
11th 0200	180	27	998.0	6	Overcast. Heavy rain.
0400	210	40	992.9	11	Overcast. Moderate rain.
0500	220	46	987.0	3	Overcast. Heavy shower.
0620	250	30–45	986.0	10	Overcast. Gusty.
0700	250	20	983.0	11	Partly cloudy.
0800	250	22	982.0	11	1 okta C_{L2}.
0830	300	45–50	990.0	20+	'Explosive' barometer.
0900	300	50	991.0	30+	3 oktas C_{L2}.
1100	290	47	997.9	15	Very heavy sea and confused swell.
1300	290	40	1003.9	13	3 oktas C_{L1}.
1430	300	40–45	1004.0	3	2 oktas C_{L9}. Violent thundery squall.
1600	310	27–40	1005.0	5	Passing heavy showers.
1700	310	30	1006.7	6	Visibility 12 n.mile outside showers.



The swell in mid-Channel was in such a confused state that it was impossible to estimate the direction, but it was probably a combination of south-westerly, westerly and north-westerly with a height of up to 6 m.

Position of ship at 1100 UTC: 50° 20′N, 00° 40′W.

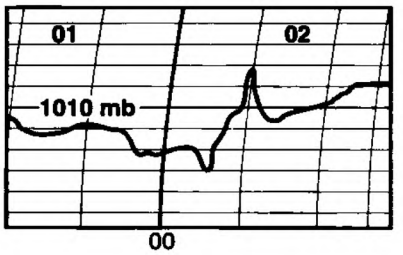
CORPOSANTS

Red Sea

m.v. *Peninsular Bay*. Captain P.A. Furneaux. Singapore to Suez. Observers: the Master, Mr A.E. Spencer, Chief Officer and Mr D. Holbrook, S1.

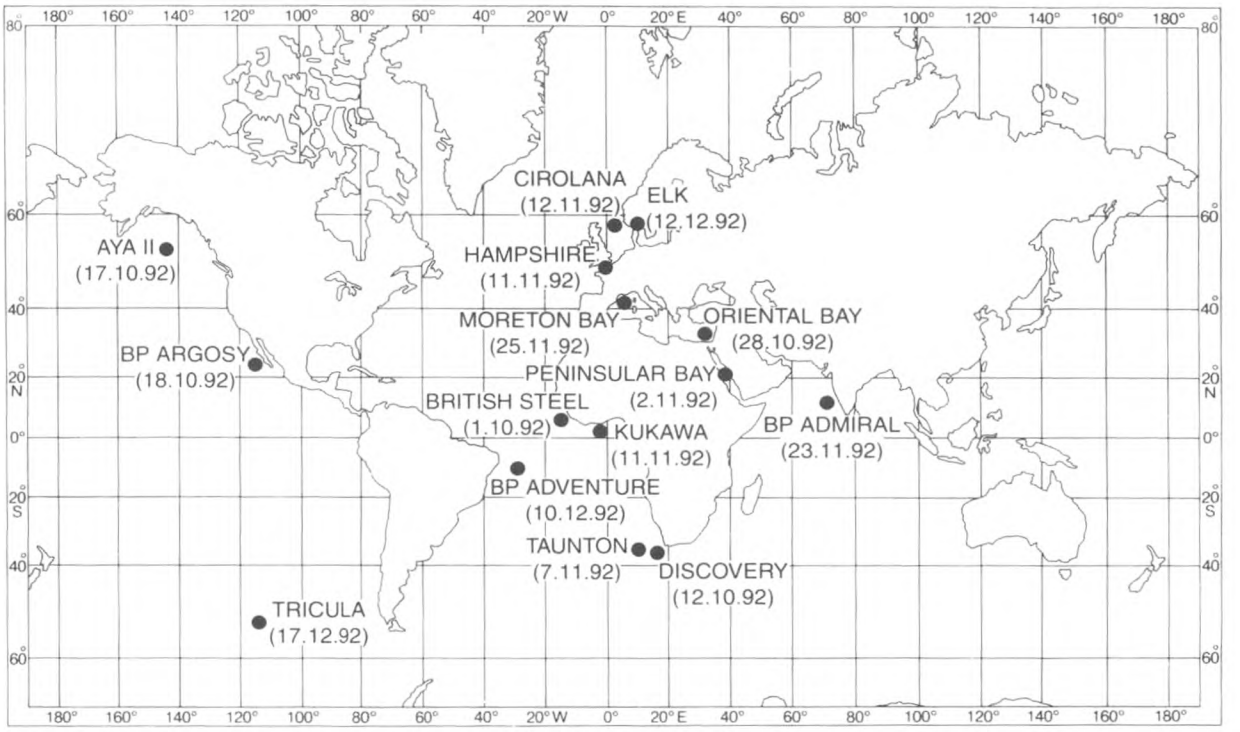
2 November 1992. The following observations were made between 0000 and 0400 UTC as the ship experienced a period of unsettled weather. The barograph trace shows the accompanying pressure changes.

0000–0120:	Constant lightning to the north; St Elmo's fire on ship's aerials.
0120:	Electrical storm overhead.
0125:	Wind suddenly becomes N'ly, force 6.
0150:	Wind shifts to ENE'ly, force 6.
0200:	Wind becomes E'ly, force 7.
0215:	Violet glow observed on top of azimuth mirror sight. Tingling sensation felt on crown of observers' heads as corposants become more pronounced.
0245:	Wind variable, force 1.
0250:	Corposants disappear from aerials.
0258–0315:	Vessel passes through squally, heavy rain with thunder and lightning.Wind NE'ly, force 8/9.
0330:	Rain ceases.



Between 0130 and 0330 there was rain of varying intensity at the ship, but by 0400 the sky was clearing from the west.

Position of ship at 0120 UTC: 20° 28′N, 38° 44′E.



Position of ships whose reports appear in the *Marine Observers' Log*

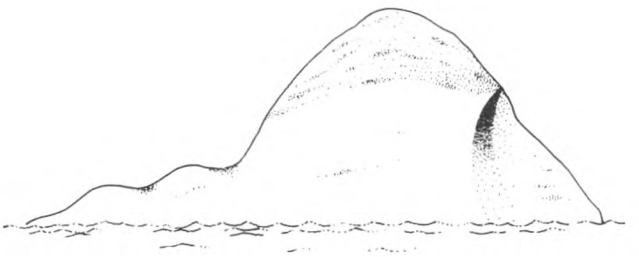
ICEBERG

South Pacific Ocean

m.v. *Tricula*. Captain J.L. Ross. Abbot Point to Redcar. Observers: the Master, Mr C. Durman, Chief Officer, Mr G.R. Gonyou, 2nd Officer, Mr A. Nath, 3rd Officer and members of ship's company.

17–18 December 1992. At 1837 UTC an echo was detected on the 10-cm radar (24-n.mile range) about 17 n.mile off. An investigation through telescopic binoculars revealed a whitish, blue-green iceberg 18° on the starboard bow, and at this time the iceberg had a bearing of 123° × 16 n.mile, which gave its position as 52° 04′S, 114° 15′W.

At 1950 horizontal and vertical sextant angles of the iceberg were measured by the Master and Second Officer, and its height was determined as 47 m and length as 117 m. Between 1837 and 1950 mist and fog obscured the iceberg at times but the CPA was 4.8 n.mile at 2000. The ARPA on the radar gave the iceberg an easterly course and a speed of 0.5 knots as derived from the speed input into the ARPA from the doppler log (water track), while the Southern Ocean Current at the site of observation was about 0.5 knots, setting east. At 1750 the position of the iceberg was more accurately found as 52° 03′S, 114° 12.5′W. The iceberg was identified as being of glacial origin; its northern part was neatly curved as though cut with a knife, and the north-east section had two small humps which the observers thought would probably calve off in due course, see sketch. A TTT message in respect of the iceberg was broadcast by the vessel on 500/512 kHz.



After crossing east of the iceberg position the vessel experienced fog with variable visibility of 0.5–2.0 n.mile until 0400 on the 18th when light drizzle cleared the fog. At about 1700 a number of Black Storm-petrels were sighted about 1 n.mile ahead of the vessel, fluttering just above the surface of the water; also present were about four Wandering Albatross which had been trailing the vessel for approximately 8 days.

The vessel was steering a course of 104° at 12.5 knots and weather conditions were as follows: air temperature 9.5 °C, wet bulb 8.0°, sea 9.3°, pressure 1010.0 mb, wind W'ly, force 6. The sky was overcast with stratocumulus, and there was a south-westerly swell of 5 m.

Position of ship at 1837 UTC: 51° 54.8′S, 114° 36.3′W.

CETACEA

South Atlantic Ocean

m.v. *Taunton*. Captain G. Hepple. Ponta Do Ubu (Brazil) to Kakogawa. Observer: Mr S. Raghavan, 3rd Officer.

7 November 1992. At 1615 UTC seven or eight whales were sighted to the north-east close to the vessel, and they seemed to be swimming slowly in a circular pattern. Among them was at least one young whale, but the adults were estimated to be roughly 15 m long and all had a curved and pointed dorsal fin. Thought to be Bryde's Whales feeding, they were not disturbed by the vessel and continued to swim in the same pattern.

Shortly afterwards a school of 10–12 dolphins was observed, the individuals leaping out of the water in close unison and heading directly for the whales' position. The dolphins had black backs with very white sides and the white colour extended high up so that the black backs seemed very narrow. They were thought to be Southern Right Whale Dolphins.

Position of ship: 36° 48′S, 13° 15′E.

m.v. *BP Adventure*. Captain K.E. Peacock. Madras to Guayama. Observers: the Master, Mr I.G. Davies, 2nd Officer and Mr C.C. Gault, Cadet.

10 December 1992. At 1200 UTC a single whale, possibly a Fin Whale, was sighted 3 points on the starboard bow at a distance of approximately 3 cables and was moving slightly faster than the *BP Adventure* which was travelling at a speed of 14 knots. It crossed ahead of the vessel, leaping clear of the water at a very steep angle and leaving its flukes 1 m free of the surface before falling back in slightly on its side, see sketch.

After crossing ahead onto the port bow in a series of leaps and dives it seemed to slow down and passed down the port side where it stayed about 4 cables off the bridge wing for several minutes, occasionally surfacing but no longer clearing the surface.

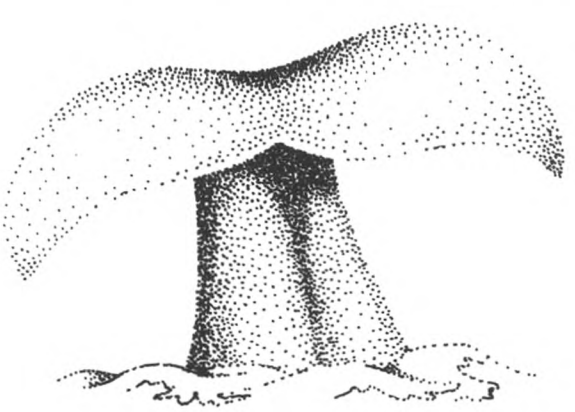
The whale was about 6–7 m long and had a black body with white undersides and what seemed to be stripes on the undersides. Its dorsal fin was large and prominently curved, the flippers were also large and black as were the flukes which were white underneath.

Position of ship: 08° 46′S, 29° 20′W.

Equatorial Atlantic

m.v. *Kukawa*. Captain W. Godsell. Tema to Takoradi. Observers: the Master, Mr J. Owusu-Koranteng, 2nd Officer, Mr W. Thompson, 3rd Officer and Mr A. Daniels, Chief Engineer Officer.

11 November 1992. At 1145 UTC whilst the vessel was sailing along the coast of Ghana about 12 n.mile south of Saltpond the observers saw a solid object sticking out of the water about 2 points on the starboard bow and 2 n.mile off. The Master was called to the bridge and he ordered the ship to be steered closer for a clearer view. The ship passed about 40 m from the object which, from the time of its initial sighting until the vessel passed it and was about 1.5 n.mile away, did not make the slightest movement and appeared as shown in the sketch.



The observers concluded that the object was a dead whale. However, they were soon proved wrong when the vessel was about 2 n.mile away because the whale dived and started to blow, and the observers realised that there were two whales and not one. In all, the first whale had remained motionless for approximately 15 minutes. The colour of the 'standing' part was pitch-black and looked very much like a concrete object; the 'flabby' part of its tail facing skywards was coloured white.

Three days later when the vessel was *en route* from Takoradi to Abidjan a similar observation was made 6 n.mile south of Cape Three Points. In this case, the whale did not move until it was almost out of sight, and the vessel passed it at a distance of roughly 1 n.mile. Again, the whale was black in colour, but no white colouring was seen.

Position of ship at 1145 UTC on the 11th: 04° 59′N, 01° 03′W.

SEALS

South Atlantic Ocean

R.R.S. *Discovery*. Captain K.O. Avery. Scientific duties off Cape Town. Observers: the Master, Mr A.R. Louch, Chief Officer and members of ship's company.

12 October 1992. At 0450 UTC whilst hove to on station 45 n.mile south-west of Cape Point conducting scientific winch trials, a group of about 20 seals or sealions was observed consisting of three large individuals, possibly bulls and about 17 smaller ones which may have been cows. All of them were a uniform dark-grey colour and were swimming on the surface as close as 3 m from the ship's bow. The group 'lazed around' for some time, apparently unconcerned about the bowthrust unit running within a few metres of them.

During discussion the observers wondered if seals ever swim in a ship's bow wave in dolphin style or scratched themselves against the hull. Large numbers of seabirds were also seen namely, up to 25 albatrosses comprising Black-browed, White-capped and Yellow-nosed species; at least 50 White-chinned Petrels; numerous Pintado Petrels, Cape Gannets and other species.

Weather conditions at the time were: dry bulb 13.4 °C, sea temperature 17.2°, wind SW'ly, force 2.

Position of ship: 34° 38′S, 17° 42′E.

Note. Ms P. Jenkins, of the Mammal Group, Department of Zoology, Natural History Museum, comments:

'The report of sealions swimming close to the ship's bow is noted with interest. Unlike dolphins which do indeed frequently swim in bow waves, seals and sealions which may be harassed by fishermen, may be more wary; however, they may also be attracted to ships if fish are plentiful nearby (sometimes becoming entangled in fishing nets), or be curious or equally unconcerned about ships.'

BIRDS

North Sea

m.v. *Cirolana*. Captain B.A. Chapman. Scientific duties in North Sea. Observer: Mr R.O. Jolliffe, Chief Officer and members of scientific staff.

12 November 1992. Between 1600 and 1700 UTC whilst the scientific staff were working on deck sorting out the trawl catch, they were alerted by a piping

whistle coming from one of a mixed flock of kittiwakes and fulmars. The call was from an Ivory Gull (*Pagophila eburnea*) and it was quickly located flying 5–10 m from the vessel.

The gull was a first-winter juvenile and was pure-white with flecks of black on the wings; its bill was dark and a dusky mask extended from the base of the bill to the eye. There was a narrow terminal band on the tail and the legs were black and the gull was slightly larger than the kittiwakes, having broader wings.

Position of ship: 58° 15′N, 02° 38′E.

Editor's note. As with all reports of natural history received, this one has been forwarded to the relevant experts for their records, in this case the Royal Naval Birdwatching Society.

Eastern North Pacific

m.v. *BP Argosy*. Captain M.A. Watson. San Francisco to Callao. Observers: Mr A.M. Largan, 3rd Officer, Mr R. Saunderson, 2nd Engineer Officer, Mrs Saunderson and members of ship's company.

18 October 1992. At about 0600 UTC whilst the ship was passing the Baja peninsula a number of small, unidentifiable hawk-like birds joined the ship and stayed for roughly 2–3 days. The most prominent feature of these birds was the marking on the backs of their heads; from a distance the impression given was of two large eyes. The majority were able to stay for so long because they would catch and eat a number of sparrow-size birds which presumably had got lost or were 'hitch-hiking'.

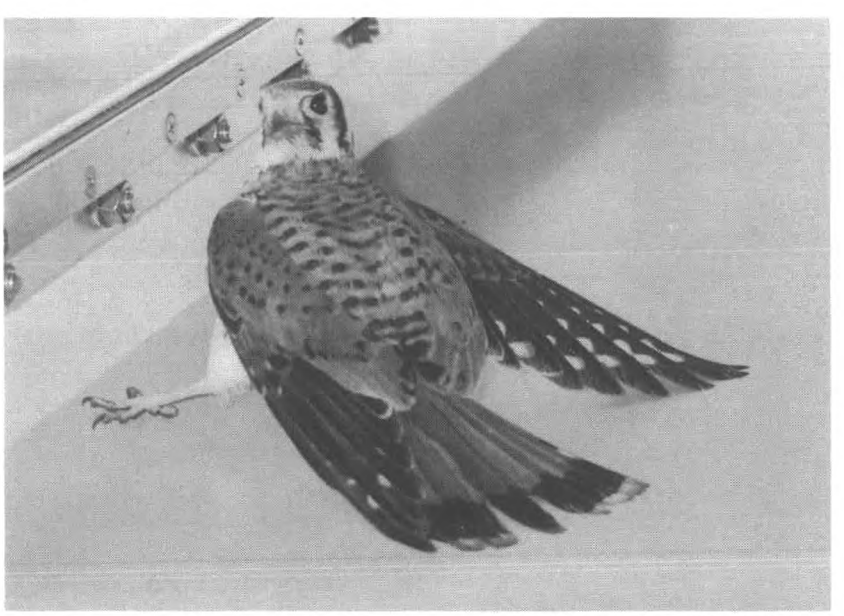


Photo. by Captain M.A. Watson

'Arnie'

When all the 'sparrows' had been eaten all the hawks flew away with the exception of one which stayed for the rest of the voyage to Peru. It became affectionately known as 'Arnie' (Arnold Hawksenegger) because he ate so much red meat, and it was thanks to the Second Engineer and his wife that Arnie survived.

After arriving in Callao the observers refused to feed Arnie in the hope that he would leave; two days later he got the message and flew away.

Position of ship at 0600 on the 18th: 22° 30′N, 111° 18′W.

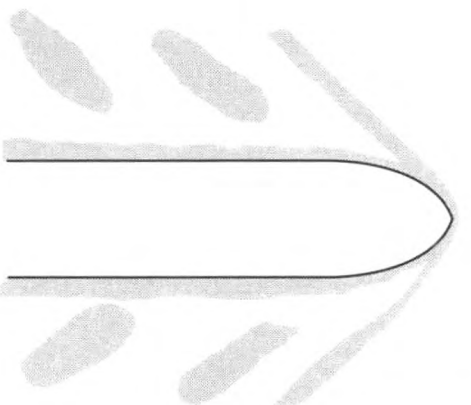
BIOLUMINESCENCE

Eastern North Atlantic

m.v. *British Steel.* Captain D.G. Olley. Saldanha Bay to Redcar. Observers: Mr R. Moore, 3rd Officer, Mr R. Ramos, AB and Mr E. Garcia, AB.

1–2 October 1992. At 0510 UTC on the 1st, fluorescent 'spots' of constant brilliance were seen passing down the vessel's sides, although nothing was seen in the wake. The spots were 10–30 cm across and appeared roughly circular in shape; they covered a large area and were randomly spaced. The event lasted for about 5 minutes during which time no noticeable smell was detected and no apparent effect was noted when shining or flashing a light on the spots. At the time the sea temperature was 27.1 °C and the wind was S'ly, force 2. The sea was slight with a low swell.

Between 0300 and 0600 the following day, the same phenomenon was observed again, but a much more spectacular show was seen, as shown in the sketch. It was noted that the bioluminescence was most prevalent down the ship's sides and in areas around where uprising air bubbles caused by the wake occurred. Additionally, the effects were more obvious on the lee side despite the fact that only a gentle breeze was present. The spectacle faded during the final hour of observation.



It was thought that the spots were, in fact, some kind of jellyfish, but no reference to this could be found on board, however. Weather conditions on this occasion were: sea temperature 28.0°, pressure 1010.7 mb, wind N'ly, force 2. The sea conditions were the same as for the previous observation, while the sky cover was 4 oktas.

Position of ship on the 1st: 05° 26′N, 13° 43′W.

Position of ship on the 2nd: 08° 48′N, 16° 19′W.

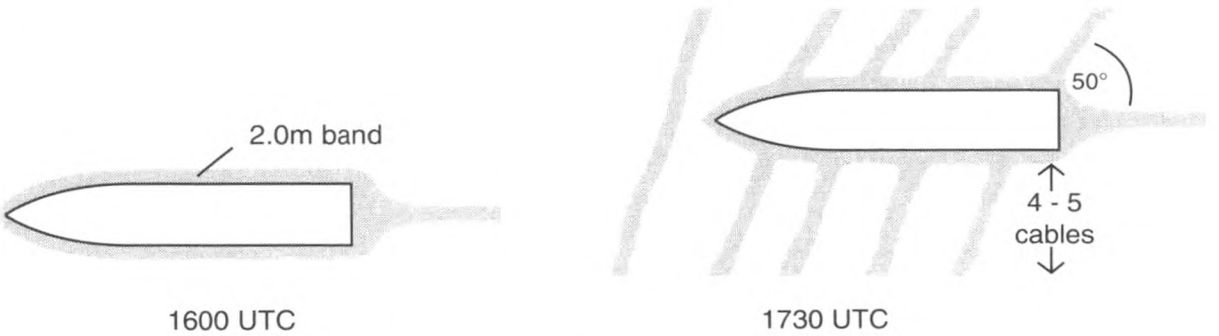
Arabian Sea

m.v. *BP Admiral.* Captain J. Ronald. Singapore to Mormugao. Observers: Mr M. Murphy, 3rd Officer and members of ship's company.

23 November 1992. At about 2100 UTC bioluminescence started to appear around the vessel in the form of a band about 1 m wide, see first sketch. After an hour the band had increased in width to about 2 m and had doubled in intensity to give an LED-type light from the bow-wave and some surrounding wave caps. This effect then seemed to stabilise at a slightly lesser intensity while the frequency of

illuminated wave caps was reduced. At 2215 the luminescence started to develop a 'star-speckled' effect at the outer edges of the band, and 15 minutes later the vessel approached six or seven parallel bands of what appeared to be an oil slick. However, as the vessel passed through these bands they too started to acquire the starry effect.

Each band was about 1–3 m across and inclined at an angle of 50° to the ship; they stretched beyond the limits of night visibility and so their exact lengths were not known, but they were illuminated for a distance of 4–5 cables on either side of the vessel, as shown in the second sketch.



Whilst passing through the bands a light was shone at them but no effect was observed, and the luminescence had dissipated by 2300. The vessel was on a course of 319° at a speed of 14 knots, and the weather conditions were: air temperature 28.5°, wet bulb 26.0°, pressure 1014.2 mb, wind WSW'ly, force 2–3.

Position of ship: 15° 56′N, 73° 17′E.

PLANETARY ECLIPSE

Eastern Mediterranean

m.v. *Oriental Bay*. Captain L.E. Howell. Suez Canal at Port Said. Observer: the Master.

28 October 1992. Shortly after the vessel cleared the Suez Canal the planet Venus was observed eclipsed by the moon in a clear sky. The bright Venus appeared to sink slowly to the top half of the bright crescent moon and at 1559 h 02 sec UTC it snapped out abruptly, appearing again to the right of the upper half of the new moon just as abruptly, at 1616.

The event was a lovely sight on a clear, cloudless evening sky.

Position of ship: 31° 30′N, 32° 20′E.

Note. Dr Richard Baum, Director of the Mercury and Venus Section of the British Astronomical Association, courtesy of Mr Ron Livesey, our aurora correspondent, comments:

'Lunar occultations of Venus, or indeed any planet, are infrequent, but not so rare as to arouse undue excitement. Nevertheless, they are always spectacular, and well worth recording. The observers on the *Oriental Bay* most certainly deserve congratulations on being witness to the phenomenon. After over 45 years astronomical observing I have yet to be so lucky.

'An occultation of Venus was recorded by the Chinese on 19 March A.D. 361. Tycho Brahe witnessed a similar phenomenon on 23 May 1587. Visible occultations are somewhat rare as they usually occur in daylight. A phenomenon of this kind was seen on 8 December 1877 over all the western part of the United States of America. Of it, Professor Pritchett of Missouri, said, "The interest taken in it was shared alike by the educated and the illiterate, and even by children". The evening was

cloudless and many persons noted the time of disappearance of Venus as seen by the unaided eye. A partial occultation of Venus took place on 12 October 1879. A fine photograph of Venus hanging on the limb of the moon was taken in 1934 by a Japanese astronomer.

'The Arab astronomer, Ibn-Jounis, reported Venus occulted the star Regulus on 9 September A.D. 885. Hind examined the observations using tables of the sun and the planets constructed by U.J.J. Le Verrier and found that in the year in question, at 1643 hours mean time, Venus did indeed approach Regulus within 1.7 minutes of arc; hence to the naked eye the latter would appear to be occulted, being overpowered by the superior light of Venus. The planet again occulted Regulus on 29 September 1817 and on 7 July 1959. It will again do so on 1 October 2044.

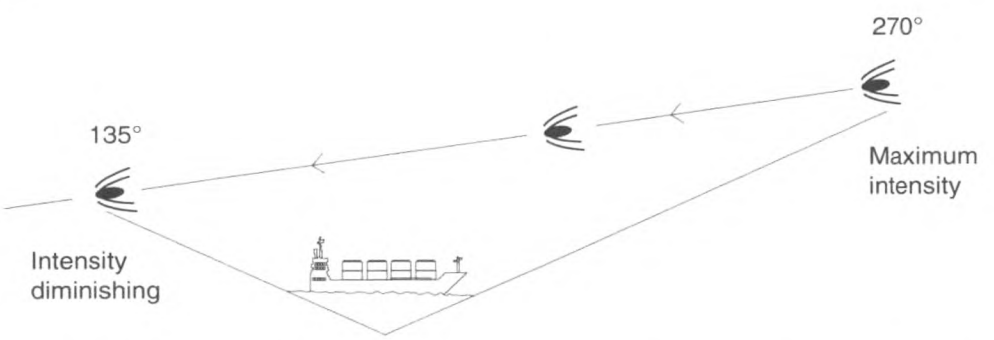
'Other historical sightings include an occultation of Mars by Venus observed by Maesatlin on 3 October 1590. Mercury was occulted by Venus on 17 May 1737. In the light of modern research, such events have lost their importance. Yet, as I said earlier, they are always worth observing for the marvellous insights they provide into the beauty of Nature, reminding us constantly of what John Ruskin endeavoured to tell us.'

SPACE DEBRIS

Western Mediterranean

m.v. *Moreton Bay*. Captain G.J.H. Peaston. La Spezia to Barcelona. Observers: Mr G.H. Smith, 3rd Officer and Mr C. Watts, SM1.

25 November 1992. At 2000 UTC when the vessel was off Toulon, a bright light in the sky was spotted on the port bow. It was first thought to be a parachute flare, but further observation proved that it was not a flare as it was travelling very slowly from the port bow, bearing 270°, to the port quarter, bearing 135°, where it eventually disappeared, see sketch. The angle of sight at the start of the observation was approximately 50° elevation and the object disappeared at 20° elevation.



Owing to the sudden appearance and direction of travel, it was thought that the object was a satellite's re-entry. Its magnitude outrivalled any other stars present, and when the object was observed through binoculars it was seen that there was a trail of debris in 'streamers' from both sides of the satellite (if it was such). The night was cloudless and the object was viewed for about three minutes. The course and speed of ship was 245° at 19 knots.

Position of ship: 42° 48′N, 06° 18′E.

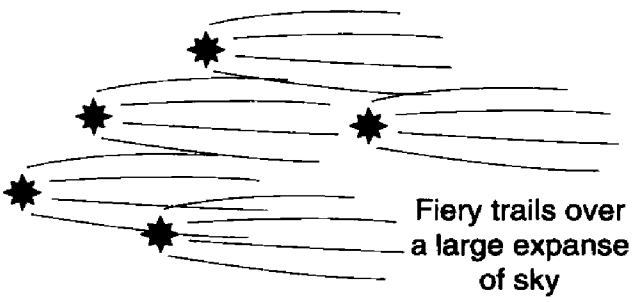
Note. Mr H. Miles, Director of the Artificial Satellite Section of the British Astronomical Association, comments:

'This was definitely the sighting of the decay of a fragment of space debris. From the description it is thought that it was a minor fragment such as a nose cone or linking bolts. Unfortunately, the times of decay for these minor items are not listed so it is not possible to identify the fragment seen.'

Skagerrak

m.v. *Elk*. Captain M.R. Godfrey. Gothenborg to Teesport. Observers: Mr G.P. Dawson, 2nd Officer, Mr C.L. Keeble, Radio Officer and Mr J. Meadows, SG1A.

12 December 1992. At 2050 UTC when the vessel was 1 n.mile east of Skagen No.1 Buoy on a heading of 315° a single white light was sighted 2 points on the starboard bow at an altitude of about 15°. It then broke into nine points like small stars and sped off horizontally in a southern direction with the points leaving fiery trails over a large expanse of sky, see sketch. The phenomenon eventually



disappeared 2–3 points abaft the port beam, the whole event having lasted roughly 30 seconds.

The sky was clear and the visibility was good.

Position of ship: 57° 48′N, 10° 47′E.

Note. Mr H. Miles comments:

'The phenomenon was without doubt caused by the decay of space debris and the description given is typical of that produced by the decay of a rocket. The break-up of the rocket into a large number of fragments, each of which producing a brilliant head followed by a fiery trail, will dominate a large part of the sky, as mentioned in the report.

It is thought that the rocket was associated with the Russian satellite Cosmos 2223, launched three days earlier, on December 9.'

551.322:551.467

The Cryosphere — a view from the Ice Bench*

BY A.P. MAYTHAM
(Met. Office Sea Ice Officer with METROUTE)

Introduction

The essential requirement of any ice service is the dissemination of sea ice data, and those from the Meteorological Office are largely collated from external sources. A watch is maintained on the seasonal variations in the mass balance of the cryosphere (that part of the Earth's surface covered by ice or snow), as these variations are an essential part of the seasonal global pattern. The formation of ice is a remarkable process in itself, and for the benefit of those who may not already know about it, this is how it begins.

The formation of ice

Cold air masses pass over the surface of fresh water, removing heat from it; the cooled water becomes denser than the warmer sub-surface water and sinks, being replaced by that warmer water from below. If it were not for a unique property of water, this process would continue indefinitely according to one of the basic laws of physics which states that any substance, when cooled, contracts, until the whole column of fresh water was cooled to 0 °C, when the transition from liquid to solid would take place. However, fresh water does not follow this physical law: the basis for the formation of ice is the anomalous expansion of water. At 4 °C fresh water expands anomalously; when further cooled below 4 °C, it no longer contracts but starts to expand. This expansion gives the water more volume and less density and, instead of sinking to be replaced by the warmer water from below, it creates a stable layer at the surface, which can now be further cooled and, if the air temperature is low enough, is able to change state.

In salt water of a density of about 35 parts per thousand, the contraction continues to −1.8 °C, when layering within the surface water region allows a change of state in the water particles to occur, creating a stable area for a time. Normal mixing will continue below this level as the next layers become stable. The ice will then grow, as the water in the layers below also cools. The average depth of the Arctic Ocean is between 1,500 and 2,000 metres, with a maximum of 2,200 metres.

In fact, neither salt water nor any saline solution will freeze. What occurs is that the water particles freeze and exclude the salts. These salts form pockets of brine within the sea ice and are gradually withdrawn downwards through the ice by the force of gravity, a process taking up to two years. As the lower part of the brine pocket melts, the water rises to the top of the pocket and re-freezes. This process continues until all the salts are excreted back to the sea, converting the sea ice into freshwater ice. This process creates a very dense parcel of saline water which then requires a greater negative temperature to freeze, and due to its density, may sink

* Excerpts from an in-house colloquium presented to staff by Captain Maytham in September 1992.

and assist the upwelling process, decaying the ice from below. The maximum possible growth of sea ice at the surface is about two metres (see Figure 1) because the necessary negative air temperatures which could increase sea ice below this depth do not often occur.

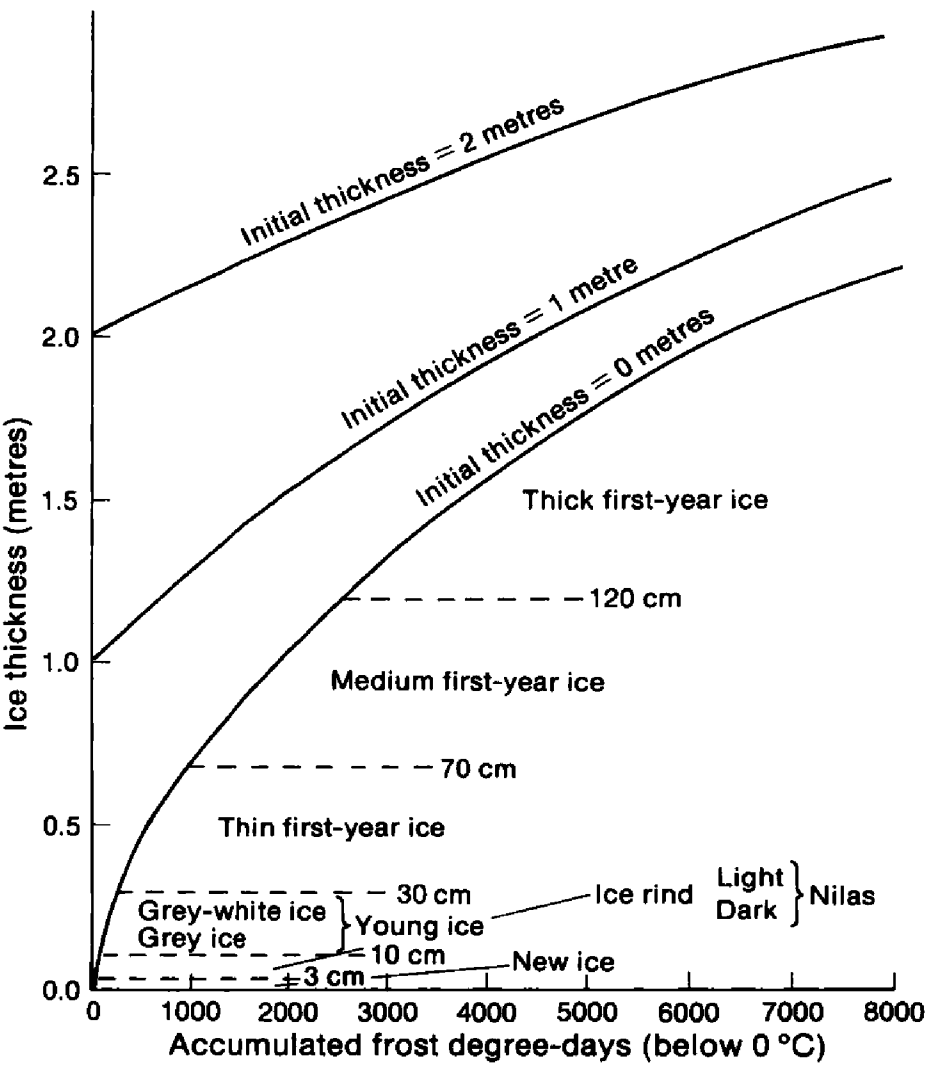


Figure 1. The formation and character of ice.

Comparisons between North and South polar regions

Perhaps the most interesting aspect of the cryosphere is that what happens at one pole is frequently opposed at the other, although they are not strictly diametrically opposed. The extremes extend to the dynamics and mass of ice, the fauna and the flora. The flora is almost non-existent in both cases and the dominant fauna consists of animals in the north and birds in the south.

The main differences between the north and south polar regions are as follows:

1. The Antarctic is an ice sheet on top of a land mass, with no inhibiting land, whereas the Arctic is a free-floating ice sheet surrounded by land.

2. The Antarctic ice sheet is seven times the size of the Arctic ice sheet, and contains eight times the volume of ice.

3. The Antarctic ice sheet has a maximum height of 5,500 metres, with glacier ice extending below sea level in excess of 500 metres: the Arctic ice is mainly two metres thick, with one-eighth above and seven-eighths below sea level, and is free-floating. (The Arctic does not include the Greenland ice sheets which are considered separate from the north polar region, and are of the order of 3,300 metres in thickness.)

4. The annual winter extent of ice in the Antarctic covers up to 22×10 million sq km, whereas the Arctic ice cover is only 15×10 million sq km.

5. In summer the Antarctic ice cover is reduced to about 3×10 million sq km whilst the Arctic decays to about 8×10 million sq km.

6. The seasonal range between winter and summer is 18 to 19 $\times$ 10 million sq km in the Antarctic and only 7×10 million sq km in the Arctic: this shows the phenomenal range of growth and decay in the Antarctic compared with the small range of the Arctic. The main reason for this variation is the ice melt off the land in the north, which puts a stable cold fresh-water barrier between the ice and the warmer waters below, preventing melt and upwelling in the Arctic. As there is no melt over the land in the Antarctic, warm upwelling decays the ice very rapidly as well as preventing major ice growth downwards.

7. The ice seasons are naturally reversed, the month of February being the winter maximum in the Arctic and summer minimum in the Antarctic. The Arctic seasonal variation is affected by the land masses surrounding the ice fields, which inhibit both growth and decay, whereas the Antarctic has no limits imposed on either occurrence.

8. Ice growth lasts for eight months, March to October, in the Antarctic, but only for four months, November to February, in the Arctic.

9. The ice decay season is also reversed, being very rapid in the Antarctic due to thin ice and warm upwelling, spread over only the three months of November to February; the corresponding process in the Arctic is the reverse, a longer period of decay of about four months from February to May, mainly due to stable fresh-water barriers.

10. The air temperature ranges also differ greatly. The Antarctic reaches a minimum of -82 °C at Vostok (approx. 79°S, 107°E) with the Arctic reaching a minimum of about -50 °C and having a normal range of 0° to -20 °C. Air temperatures of less than -60 °C do not often occur. In the south the altitude and emissivity greatly assist in reaching the extremes of temperature.

11. The ice models are also not adaptable to both regions of the cryosphere.

The phenomenal annual differences between north and south are known as the 'ice pulse'.

Because ice and fresh surface snow have a very high albedo (the ratio of the total reflecting power of a surface) of almost 1.0, and on account of night emissivity, rapid cooling of the surface takes place. The heat end of the spectrum is also reflected off the snow in the north and south in winter, thus impeding decay, conversely, impeding growth in the north once the land is reached. In the south however, the water, which has a low albedo of about 0.5, will absorb far more of the sensible heat and will increase the rate of ice decay in the Marginal Ice Zones (MIZ). The land masses surrounding the Arctic augment the warming in summer and impede the decay in winter, giving a more balanced pulse. The heat budgets for Hudson Bay in System 2 (see below) as monitored by the Canadian Ice Centre in Ottawa are sufficient to light the whole of Canada. The Hudson Bay area will remain ice free for some considerable period as the sensible heat is released, and ice gradually encroaches and covers the whole area. There may be early ice in the coastal regions as only a little heat is retained by the land. Because of late formation of surface ice with decay beneath, the central part of Hudson Bay can remain ice free, such as in 1992, when it retained large areas of open water throughout the season. However, this was of no commercial value as the Hudson Straits were ice locked.

The five parts of the cryosphere

For the purposes of the Ice Bench, the cryosphere can be divided into five separate numbered areas. Each of the five parts is a distinct system, differing not only in seasonal fluctuations but also in the forces, controls and ice dynamics which drive them. Even the wind stresses are at variance, the south having mainly continuous westerlies and the north experiencing winds from all directions.

System 1. This is the main body of the North Atlantic between the Kara Sea and Cape Farewell (Kap Farvel) at the southern point of Greenland. This has access to the polar region and is influenced by the Polar Gyre. The ice is not always new ice as there will be multi- and first-year ice from outflow at Fram Strait at various stages included in this area. There are very few bergs in this area, which do not present a hazard until Cape Farewell. (See Figure 2.)

System 2. This covers Baffin Bay, Hudson Bay and the associated bays surrounding the area, down to the St. Lawrence Seaway and the Grand Banks. This has no access to the Arctic ice and all in this area is new ice. The main feature of the area is the presence of icebergs. The influence of the Polar Gyre is insignificant.

System 3. The Pacific Arena and the Bering Sea to Japanese waters. Although there is access to the polar region, the drift and gyre move ice in the opposite direction, away from the Bering Straits, and little or no old ice is found in the seasonal ice growth southwards.

System 4. The fresh-water area of the Baltic Sea, Gulf of Bothnia and Gulf of Finland; also the salt water Black Sea area, the northern part of which freezes due to the shallow waters rapidly releasing heat. All the ice decays rapidly once the land starts to warm, due to having a low albedo.

System 5. The Antarctic. (See Figure 3.)

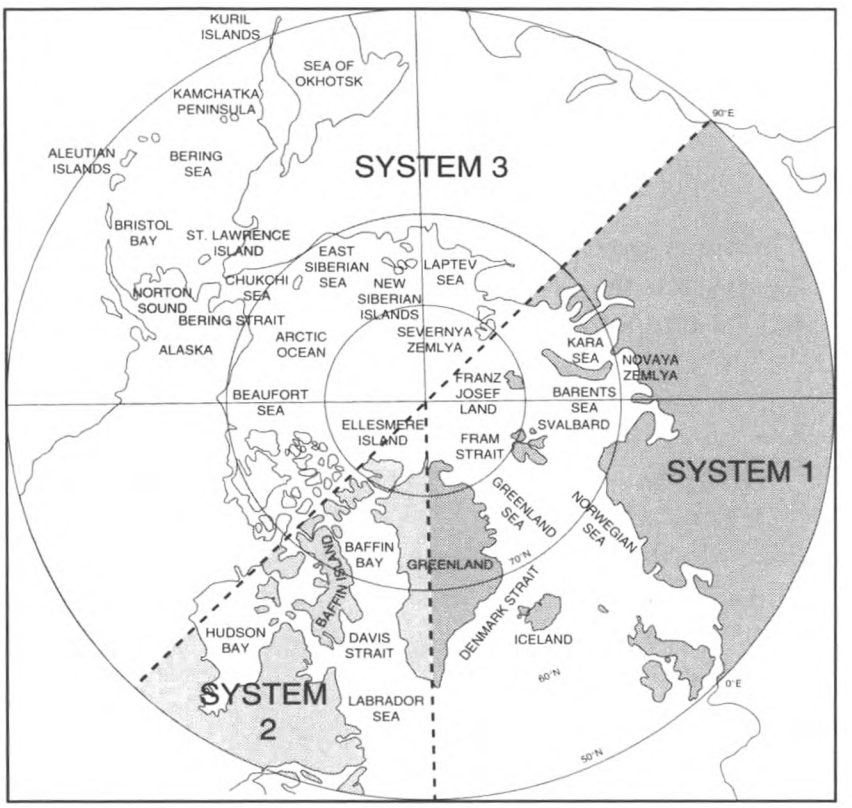


Figure 2. The Arctic, showing Systems 1 to 3.

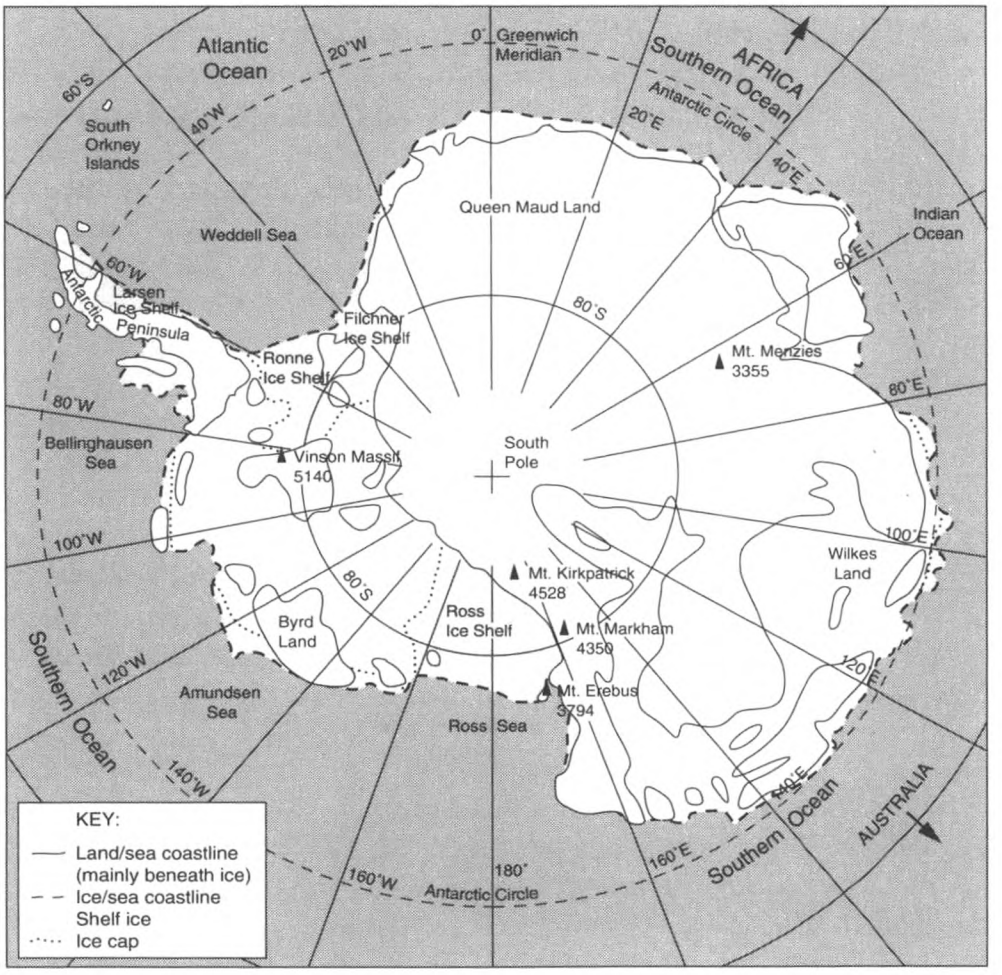


Figure 3. Antarctica.

System 1

For an explanation of the main northern salt-water system, we will make an imaginary passage with a parcel of water from a starting point in the Arctic area through the various differences as it passes through System 1. [The complementary System 2 and some of the other systems will be discussed in our next edition.]

The main influences on the north polar ice are the Polar Gyre and the Trans-Polar Drift. As the weather patterns over the pole are fairly stable and largely independent of temperate climate influences, the north polar region enjoys a certain degree of stability. There is a cold anticyclonic area over the pole, which tends to dominate the region. However, one special feature of the north is the Beaufort Sea low; this results from a recurring polynya formed by upwelling from currents in the Beaufort Sea area, where the ice is progressively cleared and the warm water triggers an area of low pressure. The wind around a low blows anti-clockwise in the Northern Hemisphere and moves the ice in a clockwise gyre. The low is not always present and the gyre may be maintained, or even started, by the high pressure over the pole. It is, however, always known as the Beaufort Gyre. Because of the starting process of the gyre, there is a drift tendency towards the Siberian coast and the New Siberian Islands. Without the gyre the ice is rapidly pulled apart by surface currents which do not assist the general gyration or drifts. The stresses from wind friction may also pull the two-metres thick ice apart, and can also greatly influence, and even overcome, the gyre and drift when they persist in any given area. (See Figure 4).

An Arctic ice floe may take many years to pass through Fram Strait between Svalbard and Greenland (80°N, 01°W), to the Atlantic.

Once our parcel of water has circulated around the Arctic, which may take up to five years, it heads through Fram Strait (the only feeder of ice influencing our System 1) and comes into the MIZ. The ice then tracks down the east Greenland coast with the East Greenland Current, being slightly deviated by other currents during this passage but eventually reaching Cape Farewell. It has been found to be approximately true that the northward transport of ice by the West Spitzbergen Current on the east side of the Fram Strait is balanced by the southward transport by the East Greenland Current on the west side. The amount of ice passing through Fram Strait is consistent when seen on seasonal graphs, each month having standard quantities of heavy, medium and light floes. These are constant and depend upon the Polar Gyre for floe quantities. However, the gyre does have periods of less strength at specific times: thus, if the Polar Gyre is known, the volume of ice for a specific period can be predicted. The Sea Ice Bench holds graphs showing the monthly maximum, mean and minimum flow of ice for the period.

These flows are about the only consistent aspect of movements in the polar region. The growth of the ice and the flow around the polar region are never constant. However, the Fram Strait monthly flow does have a consistency worth monitoring. Torna Vinje, Head of the Norwegian Polar Research Institute, has done a large amount of research on the Fram Strait; with the use of flow meters across the straits he has shown that the inflowing current is equal to the amount that flows out, although this fact is not reflected in the current charts. The currents now play a large part in the flow of ice along this coast. The charts show the main current flow and strength along the coast of Greenland. The main strength follows the continental shelf and is consistent with the maximum flow of ice along the

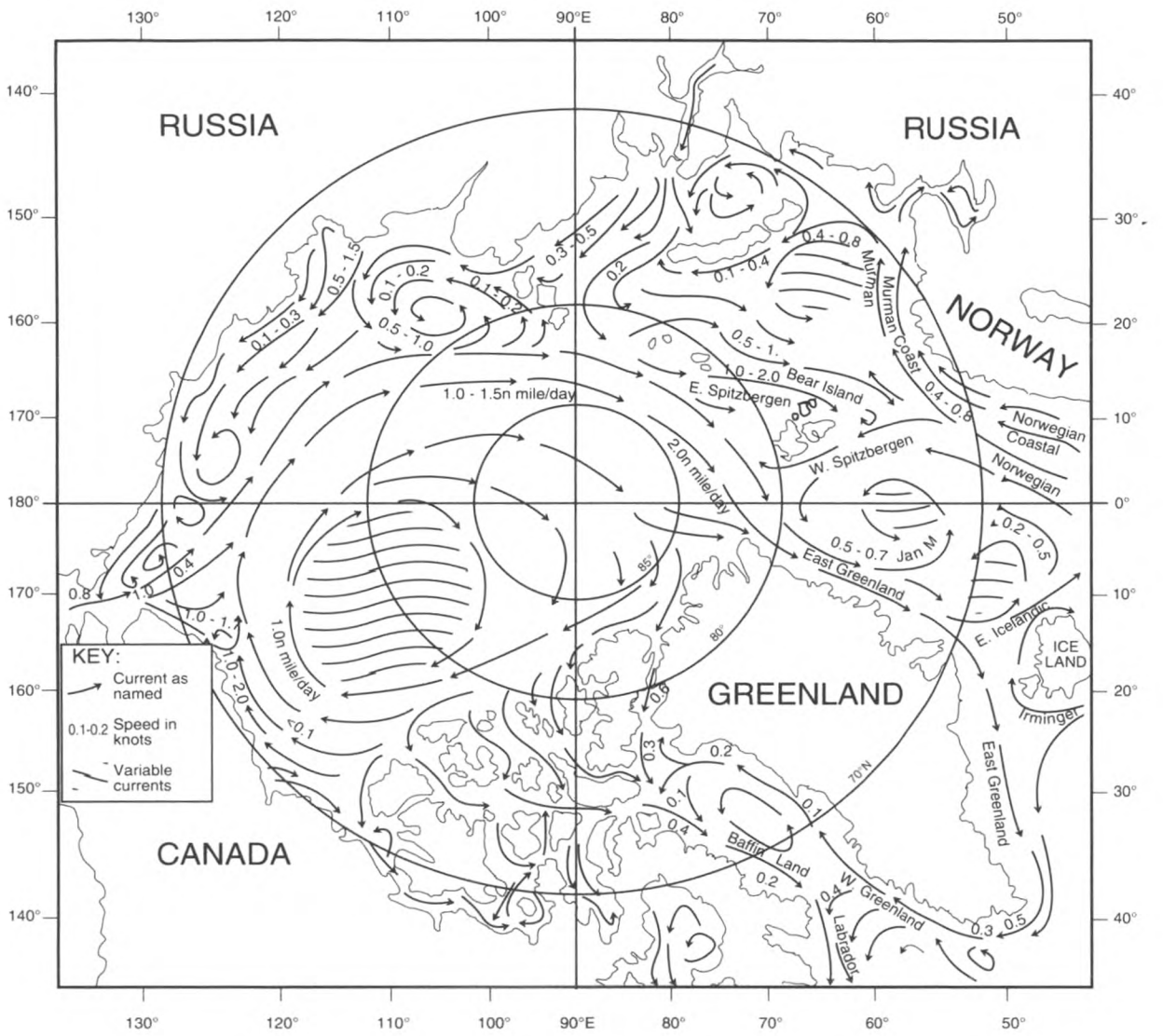


Figure 4. The Arctic. General surface circulation (current rates in knots).

marginal zone; it is also where the main mixing and melting take place. After Fram Strait there are various flaws in the topography that divert the current and hence the ice: Gulf Stream eddies also affect the mixing areas.

Satellite remote sensing

Satellite photographs taken with Advanced Very-High Resolution Radiometers (AVHRR) show small vortices developing where there is mixing, and these are of interest to the Ice Bench in determining the sites of anomalies in the region. Using the Multi-Spectral Scanner on the Landsat satellite, of the eleven channels, or bands, on AVHRR, channels 1 and 2 show a useful overall picture but the footprint area is rather small. Channel 4 detects all ice types and is very responsive to thin ice. It also senses lower ice concentrations better than the other bands and can detect the initial stages of ice growth. Together with channel 5, it is best for showing actual ice concentrations because it has the right size of footprint from its Synthetic Aperture Radar microwave scanner. Channel 5 is also the most useful for ice edge feature mapping. This will show the mixing and the vortices along the Marginal Ice Zone. (See Figures 5 and 6.)

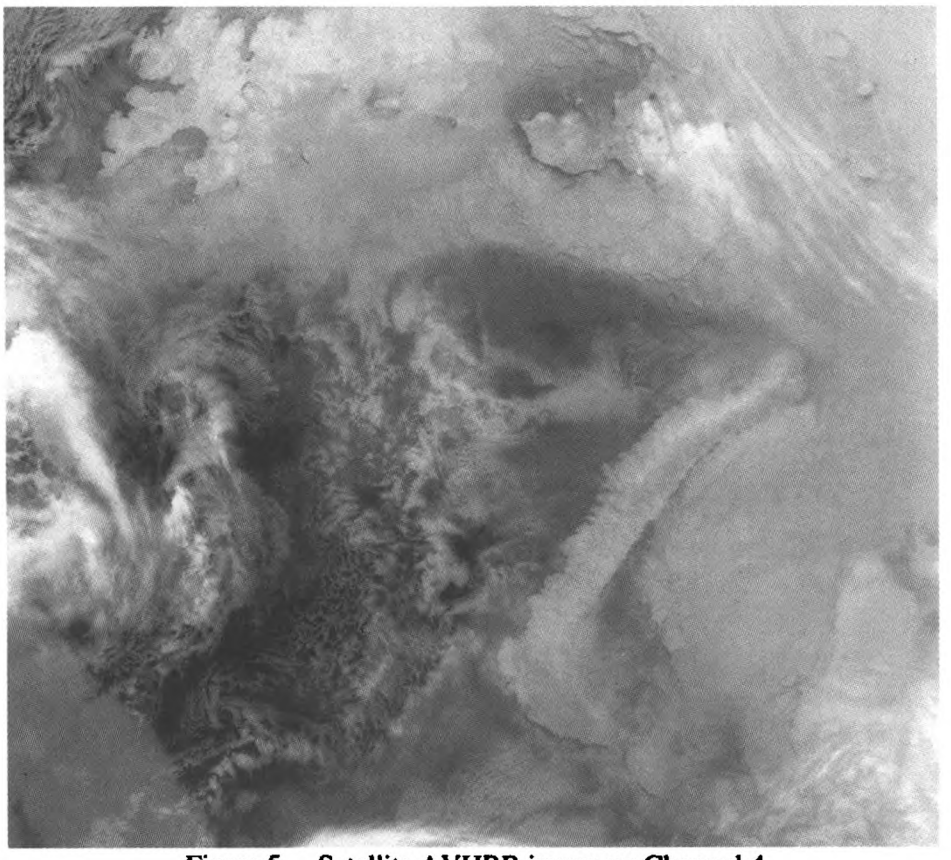


Figure 5. Satellite AVHRR image on Channel 4.

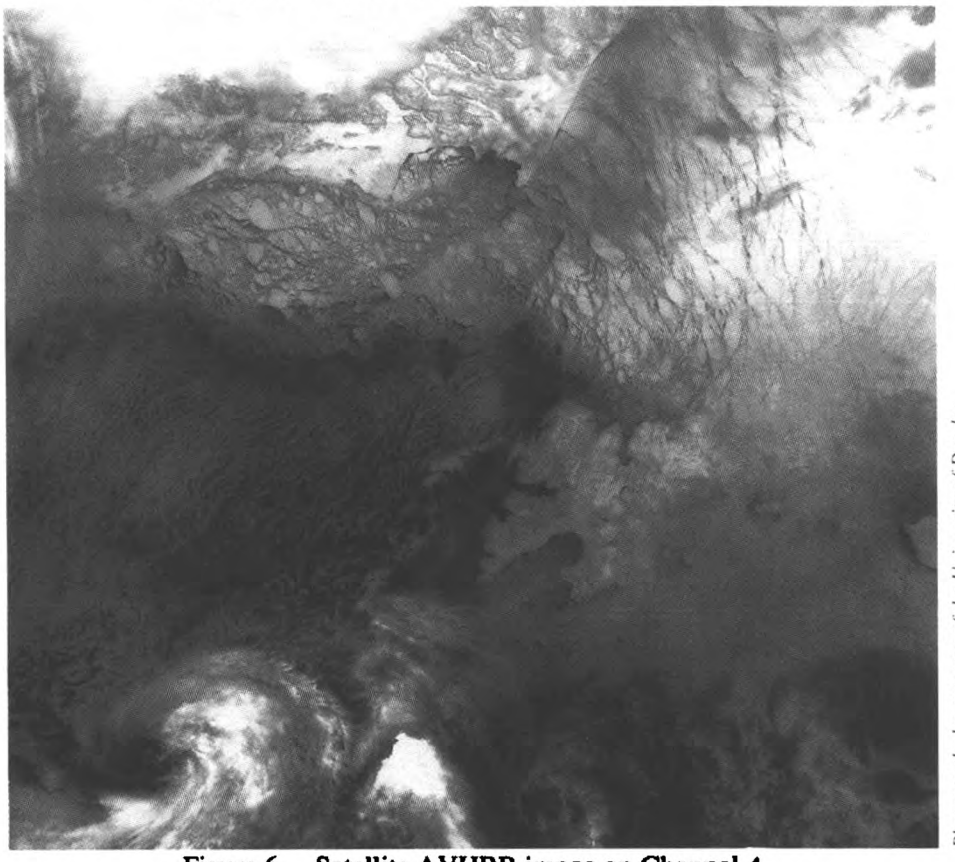


Figure 6. Satellite AVHRR image on Channel 4.

Photographs by courtesy of the University of Dundee

Figures 5 and 6. NOAA-11 satellite photographs taken on 24 March 1992 at 1109 UTC. Figure 5 (top) shows AVHRR Channel 4 visible image of the Barents Sea with pack-ice to the north-east of Svalbard [upper left] and north of Novaya Zemlya [right of centre]. Figure 6 (bottom) shows AVHRR Channel 4 infra-red image of Svalbard and the north-east coast of Greenland with pack-ice clearly seen in the upper half of the image.

Other features of System 1

There is also a large melt factor in this area. The melt generates what are known as 'frontal systems' in the water: the main north and south currents do not mix since the cold melt water is stable and is as dense as the warmer water from the south. The resulting front can be seen on a bathythermograph of the various areas. Some areas contain almost stable fresh water, and there are also areas of mixed water, both stable and unstable. It is these areas of mixed water that create problems in this particular region, mainly of fog formation; but also when cold air passes over the cold stable water the latter re-freezes.

The topography of the area shows how currents are initiated. The East Iceland Current, the Irminger Current, the Jan Mayen Current and all the associated eddies follow the main ridges and shelves. These currents divert the ice away from the continental shelf flow, causing the ice to melt rapidly. (See Figure 7.)

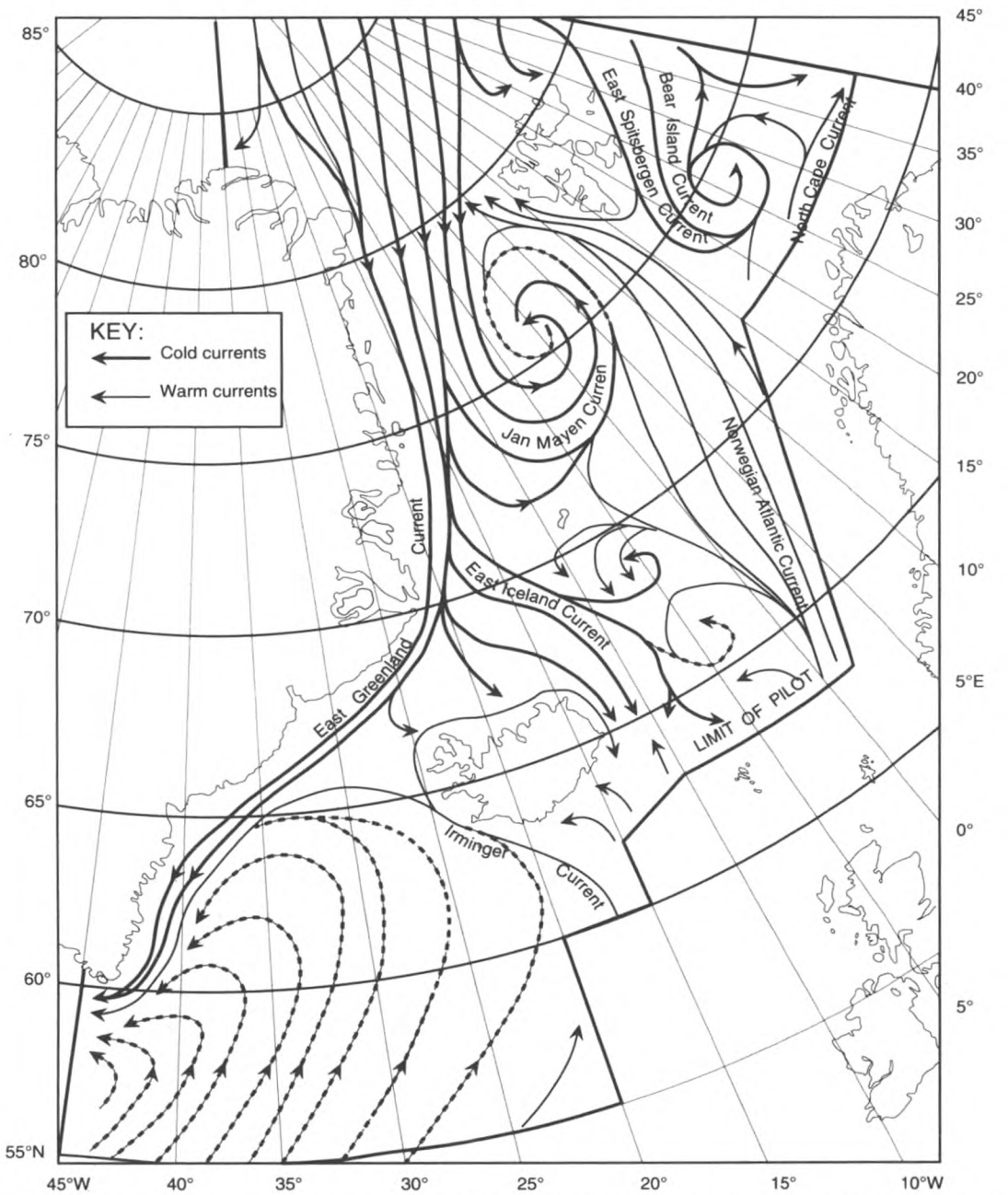


Figure 7. Norwegian Sea and Fram Strait: General surface circulation. (Extracted from Admiralty Pilot NP11, *The Arctic*, published by the Hydrographer of the Navy.)

(continued on page 189.)

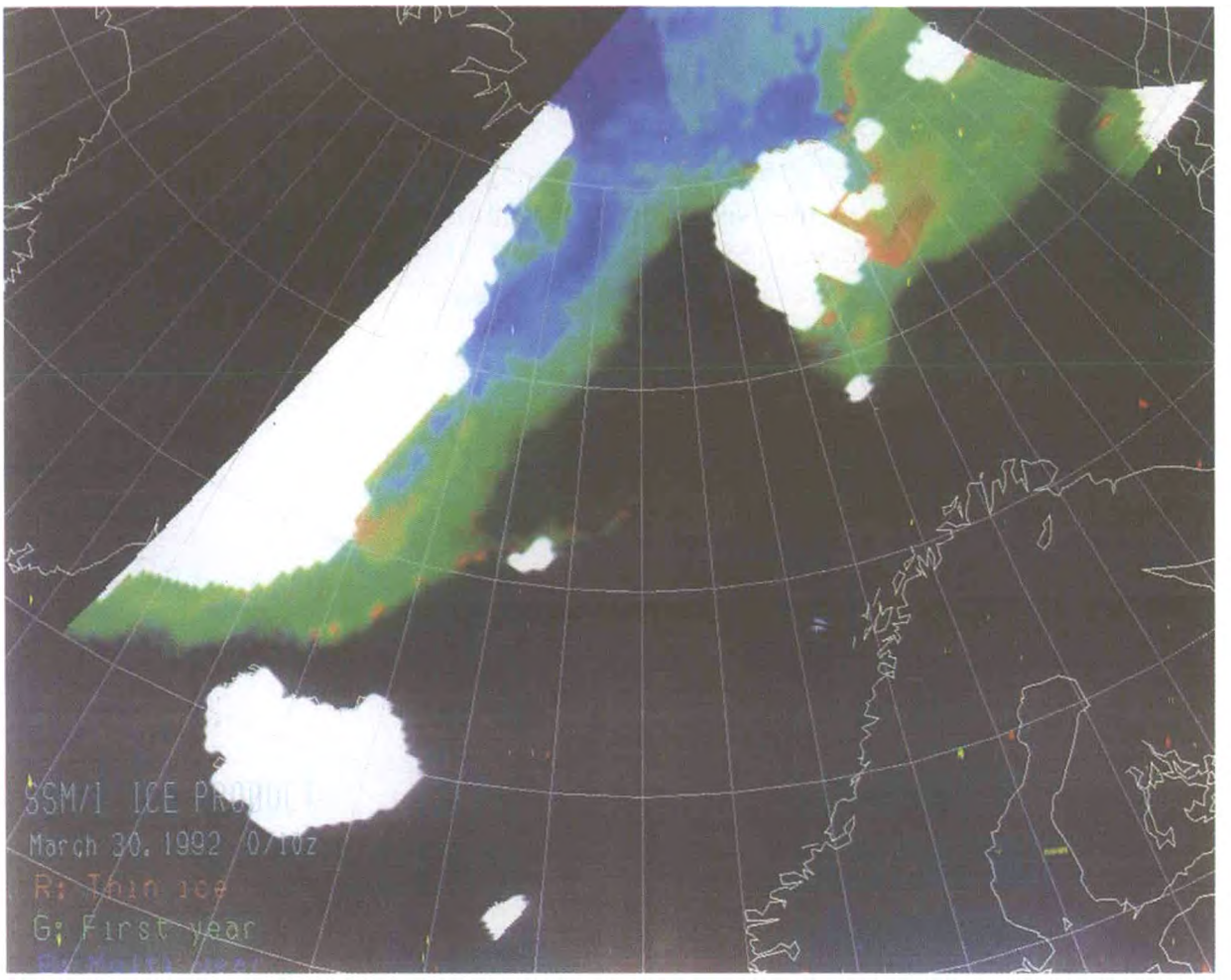
SCENE AT SEA

Cumulonimbus photographed at Singapore in April, 1990.

Photo. by K. Bradshaw

Photo. by Captain D.C.J. Still

Illuminated sky in the Strait of Malacca in May, 1990.



Courtesy of The Norwegian Meteorological Institute.

Figure 8. Clear ice edges from AVHRR showing computer colour-coded ice concentrations.

KEY: Red = thin ice. Green = first-year ice. Blue = multi-year ice.

One contrasting feature of System 1 is the relative lack of icebergs of land origin. These are few and most of the bergs are calved from the Siberian glaciers. The bergs, which are the main ones associated with the Arctic Ocean, are normally trapped within the area of the New Siberian Islands and do not pass into the gyratory system. The pressure created by the Trans-Polar Drift tends to keep all the icebergs in the area of the New Siberian Islands and the lack of bergs here is therefore an interesting feature. (See Figure 8.)

The ice seasons of the last few years have been fairly well documented and very well reported. Most ice services are trying to maintain an ice model in line with reality. The U.S.A. are using ice models for the first time to try and produce a more accurate system of modelling the ice.

[To be continued.]

The Longitude Man*

BY MICHAEL MOORE

John Harrison was born on 24th March 1693 and the National Maritime Museum, with a little help from the *Economist* magazine, has included a Harrison gallery in the massive face-lift of the Old Royal Observatory. It opened to the public, appropriately enough, on the 300th anniversary of Harrison's birth.

Most seafarers will surely find the whole Old Royal Observatory interesting, but especially the Harrison gallery. The transformation has taken 15 months and cost around two million pounds. That is for the whole complex, of course. The Harrison exhibition is just a small part of it.

Harrison was born in Yorkshire but spent his youth at Barrow upon Humber in Lincolnshire. By the time he was 20 he had taught himself the theory and practice of clockmaking. Nothing unusual there; for many other craftsmen followed a similar course. I have a long case clock made around 1730 by Thomas Downs of Louth, a town not 30 miles from Barrow upon Humber. In 1730 Harrison was making the first of his famous marine chronometers in Barrow: my clock man is not famous and my clock is not particularly valuable. So what is special about John Harrison?

The difference is that Harrison decided to go for the prize of £20,000 (around £1m in today's money) that the government of the day offered to anyone who could solve the problem of finding longitude at sea. This was far from easy and Newton, another Lincolnshire genius, had declared it impossible. Harrison, along with miscellaneous cranks and fanatics, decided to try anyway and during his long life produced four marine chronometers.

All of them were quite revolutionary and H4 (see Figure 1), the most famous of them all, lost only five seconds on a 62-day voyage. Yet the government dodged the issue and imposed more and more conditions, giving out only part of the prize money. Harrison was 80 by the time the whole of the £20,000 was paid.

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* This article was first published in the Spring 1993 edition of *The Seafarer*, and is reprinted by kind permission of The Marine Society. Further material is also extracted from other editions of *The Seafarer*.

All of the chronometers are here, along with K1, the copy of H4 which was made by Larcum Kendall and which Captain Cook took on his second voyage, achieving wonderful results. There are also a great many other chronometers, sextants, astrolabes, quadrants and other items to do with time and navigation.

Elsewhere in this exhibition one can study various electronic gadgets which give the time difference and longitude of assorted places, and one can even stand on the Greenwich Meridian, place 60p into a machine and receive in return a certificate showing the exact time (to one-hundredth of a second) you were there. Personally I think I will stick to car parking ticket machines which cost about the same and give the time to the nearest minute.

The exhibition is open Monday to Saturday 10-6, Sunday 12-6. Admission costs £3.50. A 'Passport' ticket giving admission to the whole of the Greenwich complex is also available at £7.45. For further information, telephone 081-858 4422.

Thus ends the article in question. We continue with extracts from other articles of interest on the subject.

John Harrison's interest in matters scientific developed whilst he was working as an estate carpenter near Barrow upon Humber. He acquired and copied out a series of lectures on natural philosophy and within a year or two he had become an accomplished clockmaker. This was all the more remarkable in a period when accurate clocks in large towns were rarely seen and expensive to buy, and almost unheard of in small villages. John Harrison set about making his marine timekeepers with the help of his brother James and great enthusiasm. Despite the difficulties and the scepticism of other distinguished clockmakers, the brothers completed their four sea timekeepers between 1735 and 1760, John being the inventive genius. The first three were clocks (see Figures 2, 3 and 4), the original of which being a massive brass and wood contraption weighing 72 lb, whilst H4 was only about twice the size of a normal pocket watch.

The first real trial of his most famous timepiece came in 1761 when it was carried aboard H.M.S. *Deptford* to the West Indies. Harrison's son William went with it, for by this time John was 67 years of age. H4's ability as a navigation aid was soon demonstrated: only ten days out of Portsmouth the Master of the *Deptford* began to have doubts about his position. When William Harrison was asked his opinion he was able to say with some confidence that his father's watch showed the ship to be almost 100 miles to the west of the position estimated by the ship's pilot.

As the main purpose of the voyage was to test the timekeeper the captain reluctantly agreed to rely upon it. The analogy with the early days of direction-finding springs to mind, with masters being highly suspicious of the new aid, only placing their trust in it with much misgiving. On this occasion all was well and the Madeira Group were sighted the next day, exactly as Harrison had predicted and no doubt to his immense relief. As with the case of D/F the 'new machine for finding longitude' suddenly achieved an instant and marvellous reputation. This reputation was enhanced when it was discovered that H.M.S. *Beaver*, despite having had a ten-day start, had not yet arrived at Madeira. She reached port three days later, having made the almost identical errors that had been avoided using John Harrison's watch.

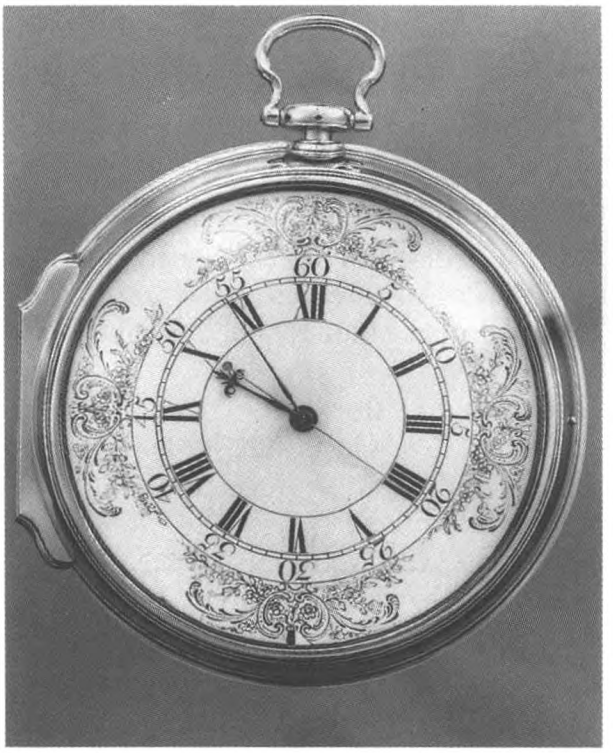

Figure 1.

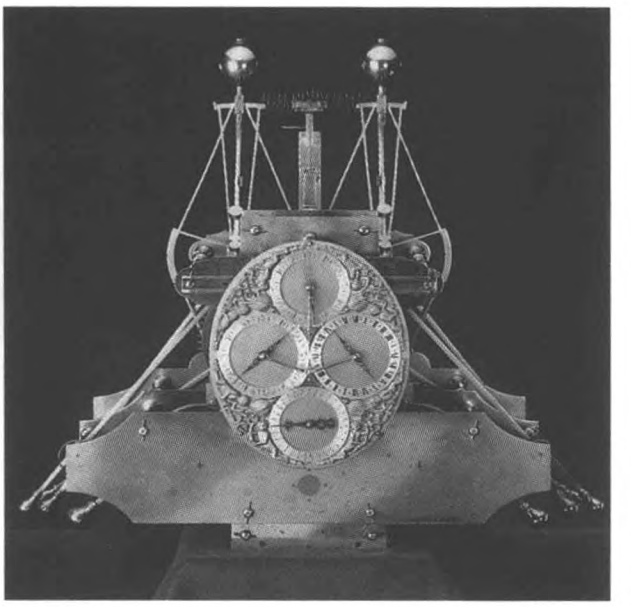

Figure 2.

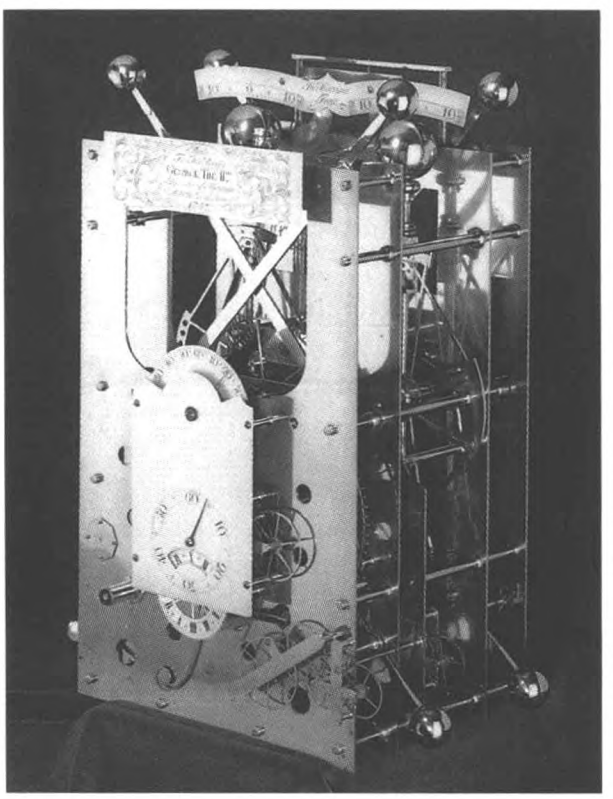

Figure 3.

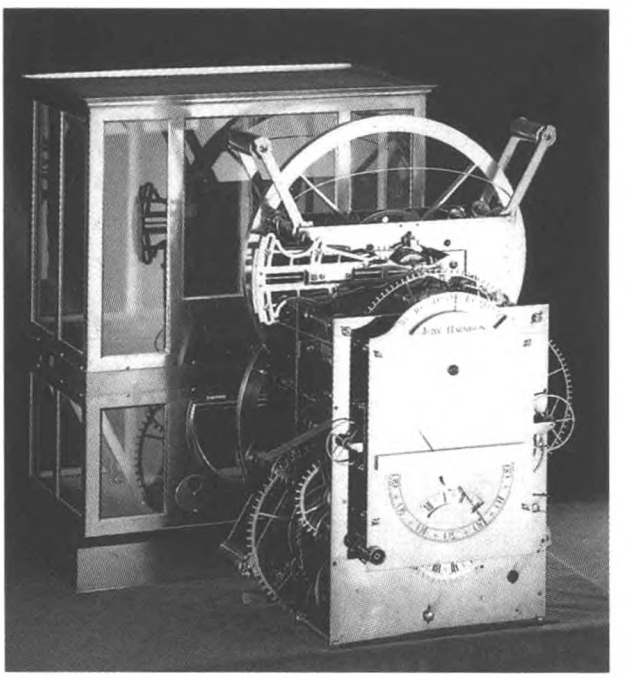

Figure 4.

Figure 1. H4, the most famous marine chronometer ever made; Figure 2. Harrison's marine chronometer H1; Figure 3. Harrison's marine chronometer H2; Figure 4. Harrison's marine chronometer H3. (*Photographs by courtesy of the National Maritime Museum, Greenwich.*)

During the voyage the watch was put to excellent use in several other ways. The positions deduced from the watch were kept secret and only known to the captain, William Harrison and an observer from the Board of Longitude. Approaching the West Indies it was disclosed to the officers that the watch predicted they should sight land the following day which, according to Harrison, 'very much surprised them for, according to their reckonings, they were 150 miles further from the

island than I was, but they did not at all dispute my being right. And so it was. Only three hours before Harrison had expected it, they sighted the land and 'the correctness of the watch amazed them very much'.

Yet successful navigation was not in itself sufficient cause to win the prize of £20,000. The only way to check the accuracy of a watch in those days was by astronomy and due to various disputes over this and the question of applying a rate, which had surprisingly not been agreed, the Board of Longitude could not agree that the watch had won the prize. Another trial was therefore ordered.

However, £2,500 was paid 'on account'. In 1764 the second trial took place and this time the question of a rate was agreed in advance. Elaborate arrangements were made and two astronomers were sent out in advance — to set up the necessary equipment for checking the accuracy of the watch. In March 1764 H4 sailed in H.M.S. *Tartar* and duly arrived at the island destination of Barbados. The captain certified in writing that William Harrison had taken two altitudes of the sun and 'declared to me we were at that time 43 miles to the eastward of Porto Santo. I then steered a direct course for it; and at one o'clock this morning we saw the island, which exactly agreed with the distance mentioned above.'

Harrison was thus encouraged, but he still had to wait until he, his watch and the astronomers had all returned to England for completion of the complicated formulae before an official result could be declared. The average error of his timekeeper was only 39.2 seconds which equates to 9.8 miles. This was clearly adequate to win Harrison the prize which asked for an accuracy of better than 30 miles, but further disappointments were still in store.

Before any money could be awarded the Board of Longitude asked for the principles and method to be disclosed so they could judge whether H4 was 'practicable and useful at sea'. The Harrisons were alarmed at this development, for the fear of piracy of the invention was ever present. Patents were difficult to obtain and international patents unknown. After protracted discussion they eventually agreed and John Harrison was awarded some money which, taking into account that which he had already received, amounted to £10,000, a very large sum in those times.

To gain the full prize money, other watches had to be made by watchmakers other than Harrison. In the event, Larcum Kendall was given full details and spent two and a half years copying H4, for which he was awarded £500 by the Board. This watch, known as K1, was an exact copy of H4 and performed just as brilliantly.

Captain James Cook, another pioneer in navigation also born into a humble background, also from the east coast of England, likewise was self-taught and added greatly to our knowledge of the world. He took K1 on his second voyage, from 1772 to 1775, Harrison's original being too valuable to be allowed out of England for this purpose. K1 did everything expected of it. Its accuracy enabled Cook to navigate with great precision and to construct charts of New Zealand with much detail, a feat which would have been almost impossible on his earlier voyage. If he had relied on lunars and shore observations (experienced though he was in taking them) they could only have been obtained at infrequent intervals and the value of his surveys would have been severely restricted.

Cook recognised the importance of being able to establish longitude with certainty. He was full of praise for K1 and the log of H.M.S. *Resolution* has several references to it. 'Our trusty friend the watch...', 'our never failing guide,

the watch...' and 'It would not be doing justice to Mr Harrison and Mr Kendall if I did not own that we have received very great assistance from this useful timepiece.'

At the end of the voyage they made Plymouth on 29 July 1775. The bearing and distance from Maker church 'shew'd that the error of Mr Kendall's watch in Longitude was only 7′ 45″, which was too far to the west.'

That represents an error of five nautical miles. The rate had been checked from time to time, for both Cook and William Wales, the astronomer with him on the voyage, were fully experienced in taking lunar distances. But Cook's expedition had been as far as 71°S, had faced pack-ice, rough seas and had crossed and re-crossed the Equator. A more exacting test could hardly have been devised.

Captain Cook's place in the history of navigation is well known and assured. Without him the development of the Pacific basin would have come much later. By contrast, John Harrison's fame is overshadowed by the more famous beneficiaries of his invention. At almost the end of his life his achievements were finally recognised and he received the full prize money. This Lincolnshire estate carpenter had an immense influence on the development of navigation. He deserves to be better known.

Meet the Port Met. Officers

For the second in our series about the United Kingdom Port Met. Officers, we highlight the roles of the two senior ones in terms of rank.

South-east England

In September Captain C.R. Downes celebrated his tenth anniversary as Port Met. Officer at Grays near London river's largest port of Tilbury. His territory for visiting Voluntary Observing Fleet (VOF) ships and liaising with shipowners and operators extends from Great Yarmouth in the north-east to Dover in the south, including the Rivers Thames and Medway, the container and cargo port of Felixstowe and ferry port of Harwich. There are a number of smaller ports which he and his Scientific Officer assistant visit occasionally. Many of the shipping and agency offices, as well as other marine related establishments which he services are in London and its environs.

Clive Downes was born in 1933 and on leaving school in 1949 he went to the famous Training Ship afloat, H.M.S. *Conway* off Anglesey. On graduating from there in 1951 he was apprenticed to Shaw Savill Line and was soon doing his bit for the VOF by sending in his first log from the passenger immigrant ship *New Australia* in August 1954. On promotion to Master in 1966, his first command was the *Cymric*, a refrigerated cargo/passenger ship of 11,000 tons gross, built in 1953. His first voyage as Master will always remain vivid in his memory: within a few days of sailing from Liverpool, south of the Azores his ship ran into declining hurricane 'Lois' and he received a commendation from the Director of the U.S. Weather Bureau for particularly useful weather reports when the ship was only 2° south of the hurricane centre. His report of the incident also appeared in *The Marine Observer* No.218, October 1967, pp. 164–165.

Captain Downes left the sea and was appointed to the Met. Office as a Nautical Officer in April 1975. He was Deputy Editor of this journal for the eight years he spent at Bracknell before being promoted to the Port Met. Office at Grays. In

addition to the duties already mentioned, he maintains a close link with Harbour Masters in his area, also Trinity House in connection with the fitting of automatic weather stations on some of their light vessels stationed around the U.K. coasts. Another task for Port Meteorological Officers is to liaise with the shipping

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Captain Downes during a Port Met. Officer's visit to observing ships in the Port of Tilbury.

industry in obtaining their views on the meteorological services provided by the Met. Office in accordance with the SOLAS agreement. He also helps to promote the commercial services of the Office with particular regard to marine climatology and ships' weather routeing. With the ongoing decline of the British merchant fleet he recruits many foreign flag ships into the VOF and routinely visits foreign observing and non-observing ships to offer advice, instrument checks and details of our weather services for shipping. In this he is helped by Mr Steve Key, his assistant who joined the Met. Office in August 1974, served much of his time in Ocean Weather Ships and was appointed to the Port Met. Office for the London area in July 1990.

Clive's wife Margaret teaches 5-year-olds in the local school near the Kent village south of the Thames where they live. He is a church-warden of his Anglican church and one of his favourite hobbies is working on his model railway which he has been building up for several years.

North-west England

Captain Albert Britain will have been 'holding the fort' at the Liverpool Port Met. Office for four and a half years, besides having the position of Ocean Weather Ship Officer, by the time he retires in December and, in a maritime career spanning 46 years, he has seen great variety and not a little interest. From his base

in the famous Liver Building and with the assistance of his Scientific Officer, Mr Peter Watson, he manages the coastal territory from the area of Holyhead northwards to Workington in the north, on the west coast of England, and services the weather observing needs of vessels as diverse as large supertankers, Sail Training Ship *Sir Francis Drake* of the Ocean Youth Club, and ferries such as *Lady of Man*. Duties include liaison visits similar to those carried out by Captain Downes.

Crown Copyright

Captain Britain framed by the Liver Building and one of the Liver Bird columns on Merseyside.

Captain Britain was born in December 1930 and his first venture to sea was as an indentured Deck Apprentice, and later Third Officer, with the Medomsley Steam Shipping Company, a combine which included Buries Markes and Crawford Steamship Company at one time, from January 1948 to November 1951. During this time he had experience in the carriage of such cargoes as timber and grain, iron ore, concentrates and phosphates as well as general cargoes.

He transferred to the New Zealand Shipping Company, then part of the P&O Group, in November 1951 and rose through the ranks to become Marine Inspector and later Master of refrigerated cargo ships before coming ashore in January 1974 to take up the position of P&O General Cargo Division Assistant Marine Manager in the Royal Albert Dock, London. In December 1977 he was promoted to Assistant Development Manager (Research and Technical) with responsibility for budgeting and overseeing equipment and fittings to new and existing tonnage of the P&O general cargo fleet. During his time at sea with N.Z.S. Co. he also stood by the company's new tonnage building in Japan, monitored ship conversions in U.K. yards for a six month period and was a Senior Chief Officer in passenger ships.

In October 1953 the Met. Office received the first of 22 meteorological logbooks he helped to compile, from m.v. *Somerset* of N.Z.S.Co. All but one of his logs earned the top marking of 'Excellent' and for his efforts he received Excellent awards on four occasions.

In March 1979 he joined the Met. Office, entering the Ocean Weather Ship service as a Deck Officer on OWS *Admiral Beaufort*, later being promoted to Master of these ships. Following his three years in the weather ships, and after an induction period of six months at Met. Office Headquarters in Bracknell, he was appointed Ocean Weather Ship Officer on 1 April 1982.

He thus saw the transfer of the OWS base from Greenock to Fleetwood and supervised the opening of a new chapter in U.K. weather ship operations, from MOD ownership, at one time of four converted corvettes, then of two refitted ships, to one weather ship managed by J. Marr & Son of Hull. He has combined his Port Met. Officer duties with his responsibilities for the husbandry of OWSs *Starella* and *Cumulus* to the present day. He has maintained an excellent working relationship with Marr's, who now manage and operate OWS *Cumulus*, on loan for the foreseeable future from the Royal Netherlands Met. Service, under the overall supervision of the Met. Office Marine Superintendent.

At the same time that OWS operations were relocated in Greenock in April 1986, with the Ocean Weather Ship Officer being allocated a room at the Port Met. Office as his local base, Captain Britain took over as Port Met. Officer in Hull on the retirement of the incumbent, Captain Jack Bentley. Again in May 1989 he was promoted and transferred to the Liverpool office, assuming the post of Port Met. Officer there on the retirement of Mr Grant Cullen, at the same time maintaining his links as Ocean Weather Ship Officer.

Pressure gradients in the North Pacific

The barograph trace shown in Figure 1 was received at Bracknell following a voyage made by the *Hemina* (34,577 tons gross, Kvaerner Shipping A/S, Oslo), across the North Pacific Ocean from Kenai in Alaska, to Inchon, South Korea. The route followed from Kenai was via the Shelikov Strait, thence by rhumbline south of the Aleutians to the Tsugaru Kaikyo and then to Inchon via the Sea of Japan.

During the passage, which commenced on 15 November, 1992, the vessel experienced large changes in pressure, and the Master, Captain P.R. Dew informed us through the Additional Remarks pages of the ship's meteorological logbook that, in 30 years of seagoing experience, he had never seen 'such steep barometric pressure gradients'.

Figure 2 shows the course taken by *Hemina* and also the tracks of significant depressions which were in the North Pacific Ocean during the latter part of November. It would appear that the pressure changes indicated in Figure 1 were probably caused by an extratropical storm (ex-typhoon 'Hunt') as it tracked north-eastwards.

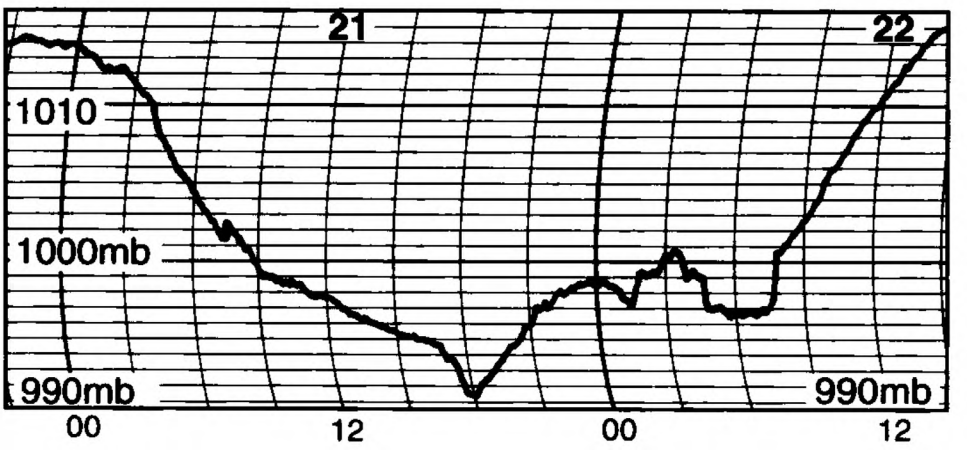

Figure 1. Barograph trace from the *Hemina*.

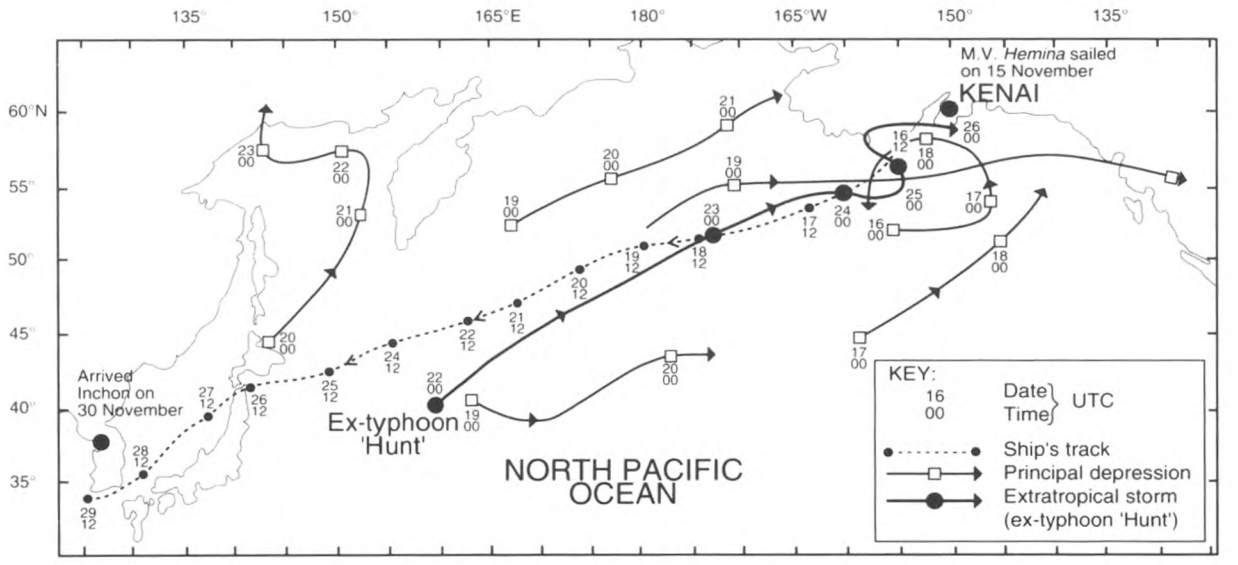

Figure 2. Track of *Hemina* and significant depressions.

The *Mariners Weather Log* (Spring, 1993), published by NOAA, gives the following analysis:

November — The Aleutian Low at 996 mb was about 6 mb deeper than normal while the subtropical high with definable centres in the mid-Pacific and over northern California was 4 to 6 mb stronger than normal. This combination usually spells trouble because of tight pressure gradients between the high and low pressure areas, which indicate strong winds even on a climatic chart.

Typhoon Hunt had recurved towards the north-west and was undergoing an extratropical transformation [on about the 20th]. By 1200 on the 22nd its 986-mb extratropical centre had crossed the 45th parallel near 170°E. During the next 24 hours, its pressure dropped 38 mb to 948 mb and it was over the Alaska Peninsula, while its circulation was affecting the northern shipping lanes mostly east of the dateline.

We hope this explanation goes some way towards accounting for what was felt by the Master to be an unusual occurrence, and our thanks go to the Editor of *Mariners Weather Log* for use of the analysis and also for the depression tracks in Figure 2.

AURORA NOTES OCTOBER TO DECEMBER 1992

By R.J. Livesey

(Director of the Aurora Section of the British Astronomical Association)

In Table 1 are listed the marine observations received for the present period. Any late arrivals will naturally be fed into the auroral archives and recorded in the auroral register.

Table 1 — Marine aurora observations October to December 1992

Date	Ship	Geographic Position	Time (UTC)	Forms in Sequence
18/19 Oct.	*Cumulus*	55° 43'N, 22° 44'W	2100	qG
21/22	*OOCL Challenge*	51° 30'N, 56° 24'W	0010–0200	RB.RA.G
26/27	*Cumulus*	55° 52'N, 19° 02'W	0001	qG
27/28	*Cumulus*	55° 57'N, 18° 44'W	2000	qG
23/24 Nov.	*Norna*	58° 30'N, 06° 06'W	1825–2040	G. Max. height 15°

KEY: q = quiet, G = glow, RA = rayed arc, RB = rayed band.

During the period the most active auroral nights reported were 15/16 and 26/27 October, 28/29 and 29/30 December. The December activity was of the type due to a shock-wave in the solar particle wind, in this case, according to NOAA, coming from a disappearing filament in the sun's atmosphere. This is a structure that may exist for some time and then the magnetic structure suddenly reorganises itself. Magnetic energy is released to eject particles in the form of a high-speed shock-wave which, if it encounters the Earth can cause magnetic and auroral storms.

We are in the declining stage of the sunspot cycle when the coronal holes (so called) develop on the sun's outer atmosphere which is normally bound in by the magnetic fields acting on the electrified particles of which it is made. A coronal hole is a region of weak magnetic field and particles can escape like jets of high-speed wind. So long as the Earth is in the correct orientation with the sun and the hole remains in being, the Earth is sprayed with particles on every rotation of the sun.

There have been several coronal holes on the sun in the present period, and the majority of auroral and associated magnetic activity has been of the quieter type associated with these wind streams. The aurorae tend to comprise glows, arcs and sometimes rays, but no major storms of the shock-wave type. In British waters 18 event nights were reported upon from the Moray Firth northwards while only eight event nights were seen from Leith southwards.

Taking the planetary index K_p with a value of five or more as an indication of stormy conditions we find that it reached that value on nine days in October, five days in November and four days in December. In contrast, there were 15 such days in February last. With regards to shock-wave events there were only five such events in the present period whereas there were 13 active days from January to March. Amateur radio operators in the United Kingdom reported an increase in radio aurora effects from October to December and this reflects the state of the aurora activated ionosphere. It should be noted that visual and radio aurorae do not necessarily coincide.

There are other features in addition to the coronal holes which influence the presence of auroral and magnetic activity at this time. At sunspot maximum the sun's magnetic field at the solar surface more closely resembles the kind of magnetic field existing on the Earth, see Figure 1(a). That is to say, the magnetic field radiates out as if a large bar magnet had been placed on the solar magnetic axis. The sun goes through a period when the surface magnetic field breaks up into magnetic sectors (Figure 1(b)) so that zones of opposite polarity appear all over its

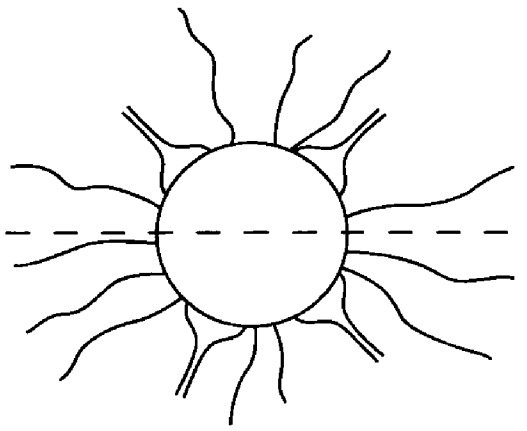

Figure 1(a)

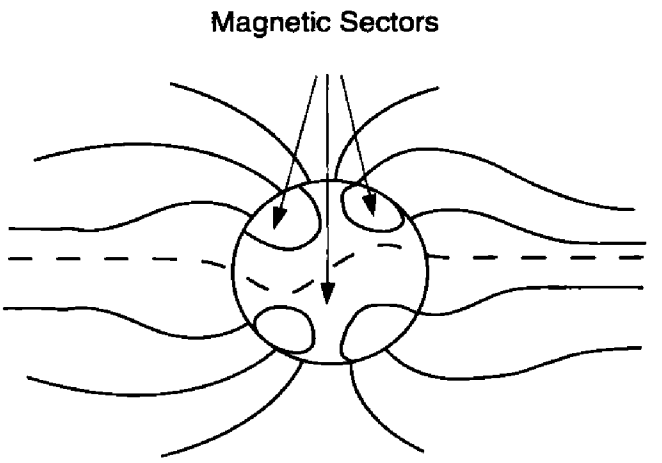

Figure 1(b)

surface on both hemispheres. This leads to variations in the flows of particles leaving the sun for the Earth. It is comparable to gusty conditions in terrestrial wind, and can affect the magnetic field and the aurora. At sunspot minimum the sun's magnetic field deviates from the radial structure and the field in the polar regions disperses so that it can 'fold over' towards the solar magnetic equator.

The equinoctial effect during sunspot decline is such that at the spring equinox the location of the sun with respect to the Earth allows particle streams from active areas in the sun's higher southern latitudes to encounter the Earth. At the autumn equinox the orientation favours the sun's northern hemisphere activity.

LETTERS TO THE EDITOR

(Letters to the Editor, and books for review, may be sent to the Editor, *The Marine Observer*, Met. Office, Scott Building, Eastern Road, Bracknell, Berks RG12 2PW.)

Raining — sheep?

My command, m.v. *Alam Selamat*, is almost brand new at seven months old and we are very house-proud; my Chief Officer personally mops out the bridge deck with fresh water every morning. Shortly after he had completed drying everything at 0630 hours this morning, Friday 12th March 1993, when all was sparkling clean, there was a sudden rain shower lasting about 25 minutes: this was probably caused by a frontal system passing over the vessel. As the rain began to dry on the warm decks, we noticed patches of what at first looked like slime but after it had dried appeared to be wool or cotton wool.

We send you a sample of the material and the facsimile chart of the relevant surface analysis, showing my additions of ship's position at the time as 41° 43'S, 167° 40'W, course 100°, speed 13 knots. Although this phenomenon may not be unique, I wonder if New Zealand or Australia realize how much of their resources they are losing to the skies? If you have no use for this report, please pass it on to your Antipodean colleagues, as the front concerned probably formed over New Zealand.

Captain J.N. Gowrie, Master, m.v. *Alam Selamat.*

Editor's note: But for the record that Captain Gowrie has been observing at sea since a logbook from Paddy Henderson's *Salween* in 1956, we might have doubted the veracity of this incredible report. 'Raining cats and dogs' is one thing, but fallout from sheep ...?

We have retained the hank of material weighing but a few grams as sent to us, and any reader volunteering to analyse and report on it is welcome to receive it from us. Unfortunately we no longer have the willing co-operation of the Natural History Museum to assist us in this particular field. The ship appears to have been about 750 n.mile east of North Island at the time of the occurrence, whilst the occluded front lies over her position and curves from a position just north of New Zealand. A strong area of high pressure over New Zealand is shown to be moving east at 10 knots.

Personalities

(Readers are invited to notify the Editor of any Officers of the Navigating or Radio Departments, concerned with voluntary observing, who have recently retired.)

OBITUARIES — Following the collision with bulk carrier *Western Winner*, resulting in a serious fire on the BP tanker *British Trent* off the Belgian coast on 3 June last, we were much saddened to discover that nine crew members had lost their lives in the tragedy. We offer our sincere condolences to their families and friends, and concerning those lost who were involved with the weather observing on board, we are indebted to Captain Hopkins, BP's Marine Superintendent, Gas and Marine, for the information provided.

Chief Officer ADRIAN HIRST, aged 25, from Tyne and Wear, joined BP as a cadet in October 1984, also attending South Shields College. On completion of his cadetship he joined *British Tay* as Third Officer in May 1988 and shortly afterwards relayed the first of twelve first class meteorological logbooks to the Met. Office. His wife Kathryn survived the fire when he ensured she was safely disembarked into the Wandelaar pilot cutter, before he returned to fight the fire and lost his own life.

Third Officer ROBERT BOLD was born in Banbury 54 years before he perished and trained with Sunderland Pilotage Authority as an Apprentice Harbour Pilot until 1960. He first went to sea as Third Officer on *Caltex Auckland* and progressed to the rank of Chief Officer with Mobil. He was then employed ashore for 12 years in the Middle East and on returning to sea in 1991 he was appointed Third Officer of *British Tay*, from whence he sent the first of four logs we received from him.

Third Officer DAVID COX was 25 and came from Cork, Ireland, undergoing his cadetship at Cork College. On leaving the college he joined the *British Beech* in 1990 and sailed on BP ships until his untimely death. The Met. Office received from him one log from *British Success* and three from *British Beech.*

Radio Officer KEVIN KIELTHY came from Wexford, Ireland, and was aged 48 at the time of this disaster. He obtained his Post Master General's Class 1 Radio Certificate in 1964 and we received the first log bearing his name from the *Herefordshire* in July 1966. He joined BP Shipping (BP Tanker Company as it was then known) in 1970 and his first log in that company came from *British Avon* in September 1973. He remained with BP to the end and sent in a total of 41 logs, gaining Excellent Awards in 1990 and 1991.

At the time of the tragedy the *British Trent* was bound from Antwerp with a cargo of motor spirit for Italy and had just dropped the pilot at the Wandelaar Pilot Station in thick fog when the collision occurred. The *Western Winner* was approaching the pilot station to embark a pilot for Flushing.

RETIREMENT — CAPTAIN W.A. WILSON retired from Blue Star Ship Management Ltd on 11 April after serving 43 years with that group.

Bill Wilson was born in Sunderland in April 1933 and educated at Rugeley (Staffs) and Bede (Sunderland) Grammar Schools, before attending South Shields Marine School for his pre-sea training.

On 16 March 1950 he joined his first Lamport and Holt ship, m.v. *Delane*. It was not until March 1957 that we received his first meteorological logbook when he was Second Officer of the *Lassell*. Two years later he was in possession of his Master's Certificate and in 1964 he undertook his first command of the *Vamos*.

On transferring to the parent company, Blue Star, in 1975 he continued his co-operation with voluntary observing on many of the Star ships, also *ACT 1*, *ACT 7*, *Churchill* and *Hoegh Duke*. Before, during and after the Falklands campaign, Captain Wilson commanded the *Avelona Star/Keren* between January 1983 and July 1984.

Captain Wilson sent a total of 48 logs bearing his name to the Met. Office, including 10 marked excellent. He received Excellent Awards in 1984, 1985, 1986 and 1989. Our thanks to him for this brief information and good wishes in retirement.

RETIREMENT — News of the retirement of CAPTAIN F.K. GORDON last year reached us too late for earlier inclusion, but we can now pay tribute to a long-serving Canadian Pacific company Master.

Francis Keith Gordon was born on 29 March 1934 and educated in his home town at Birkenhead Park High School. For pre-sea training he attended the Aberdovey Outward Bound School for one month and Liverpool Nautical College for three months in the last quarter of 1950.

In January 1951 he was indentured to the Anglo Saxon Petroleum Company, sailing as a Cadet on t.e.s. *Theobaldius* on 2 February of that year. He continued to serve with the Shell Company until in 1958 he transferred to Esso, with which

company he sailed for six years and from whose ship *Esso Exeter* he sent in his first meteorological logbook in April 1961. Over the next few years he also sailed with Booth Line and Chapman & Willan, until joining CP Ships in 1970.

Having obtained his Master's Certificate in January 1966, Captain Gordon was given his first command in August 1973, m.v. *G.A. Walker*. He also had command of the *Dart* and *Canmar* ships, latterly under the banners of B.C.P. and Barber Ship Management. The Met. Office gratefully received from him a total of 40 logs, also a further 13 VSOP North Atlantic special log sets from 1988–90 which received Excellent markings, all during the 18 years in which he carried out observing.

Following his retirement on 1 September 1992, Captain Gordon set about qualifying as a remedial therapist and masseur and is now practising in Wallasey. He married his wife Helen in 1956 and has a daughter Diane who is presently doing research for her PhD at Leicester De Montfort University. We wish him success and pleasure in his pursuits, and in his hobbies which include ballroom dancing, crown green bowling and fly-fishing. To end with Captain Gordon's own words: 'Many thanks for the service you have always given to myself and all seafarers: your work is invaluable, particularly to the Master Mariner. I have always enjoyed my years of reporting the weather to Bracknell and have tried to encourage the junior officers to take a keen and enthusiastic interest in doing the reports correctly, sadly not always with complete success.'

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INDEX TO VOLUME 63, 1993

Subjects of *Notices to Marine Observers*, photographs and persons named in *Obituary* and *Retirement* notices are indexed under these general headings.

Alcides, 19
Andes, 17
Annual Report of the Observations (Marine) Branch for 1992, 50
Assistance to yacht in distress, Eastern North Pacific, 20
Astrid, 59
Atlantic Universal, 11
Auckland Star, 20
Aurora Borealis:
  North Atlantic Ocean, 116
  North Sea, 18
  North-west Scottish waters, 67
Aurora notes, 40, 87, 131, 198
Awards, Special Long-service:
  BELL, CAPT. A.D.G., 84
  ELLIOTT, CAPT. C.R., 84
  PATRICKSON, CAPT. D., 84
  SOMES, CAPT. E.D., 84
Aya II, 166

BP Admiral, 174
BP Adventure, 170
BP Architect, 110
BP Argosy, 109, 173
Barographs, Presentation of, 85
Benavon, 8, 57
Bioluminescence:
  Arabian Sea, 174
  Bass Strait, 17
  Eastern North Atlantic, 174
  Western Mediterranean, 16
Birds:
  Arabian Sea, 113
  Caribbean Sea, 62
  Eastern North Atlantic, 61
  Eastern North Pacific, 173
  North Atlantic Ocean, 13
  North Sea, 113, 172
  Weddell Sea, 14
Book Reviews:
  Fairplay World Shipping Directory 1992–1993, 45
  Dolphin Days — The Life and Times of the Spinner Dolphin, 93
  This is the Colour Book of Knots, 94
  War at Sea 1939–1945, 94
Bransfield, 15
British Renown, 68
British Resolution, 110
British Skill, 65
British Steel, 64, 174
British Success, 114
British Trent, 16

Cardigan Bay, 115
Cetacea:
  Eastern North Atlantic, 59
  Eastern North Pacific, 60
  Equatorial Atlantic, 171
  Mona Passage, 12
  South Atlantic Ocean, 170
  Tasman Sea, 112
Cirolana, 172
City of Durban, 60
Cloud formation off Oamaru, New Zealand, 83
Corposants:
  North Pacific Ocean, 109
  Red Sea, 168
Cryosphere,The, a view from the Ice Bench, 178
Currents:
  Indian Ocean, 110
  South Atlantic Ocean, 10, 11
  South China Sea, 110

Depressions:
  English Channel, 167
  North Pacific Ocean, 166
  South Pacific Ocean, 7
Discoloured water, North Atlantic Ocean, 64
Discovery, 172
Drupa, 108

Eclipse:
  Eastern Mediterranean, 175
  Eastern South Atlantic, 68
Editorial, 4, 162
Elk, 177
Encounter Bay, 14
Enterprise, 111
Equinox, 13
Excellent Awards, 98
Eye of the Wind, 69

Fish, North Atlantic Ocean, 112
Fleet Lists:
  Australia, 48, 154
  Great Britain, 44, 140
  Hong Kong, 48, 155
  India, 48, 155
  New Zealand, 48, 157

Haloes:
  Eastern South Pacific, 17
  Indian Ocean, 65
Hampshire, 167
Havkong, 67
HERRING, P.J. and M. WATSON, Milky Seas: a Bioluminescer Puzzle, 22

Icebergs:
  South Atlantic Ocean, 58
  South Pacific Ocean, 169
Insects:
  Caribbean Sea, 63
  East China Sea, 115
  Panama Canal, 115
  Red Sea, 63
  South Atlantic, 15
  South Pacific Ocean, 14
  Strait of Malacca, 114

Jahre Spray, 62
James Clark Ross, 14
JELLEY, J.V., The tides, their origins and behaviour, 71
Jellyfish, Eastern North Atlantic, 60

Kukawa, 171

Letters to the Editor, 43, 90, 132, 199
Lima, 65
Lincolnshire, 9, 12, 63
Liverpool Bay, 113
LIVESEY, R.J., Aurora notes, 40,
London Spirit, 60, 116
Longitude Man, The, 189
Low, Record North Atlantic, 120

Maersk Cadet, 58
Mairangi Bay, 10
MAYTHAM, A.P.
  The Northern Passages, 32
  The Cryosphere — a view from the Ice Bench, 178
Meet the Port Met. Officers, 122, 193

Meteorites:
  Arabian Sea, 65, 67
  South Atlantic Ocean, 66
  South China Sea, 116
Meteorological Office Staff:
  Observations (Marine) Branch, 202
  Commercial Services, 203
  Offshore Advisors, 203
Met. Office College celebrates 21 years, 137
Milky Seas: a Bioluminescent Puzzle, 22
MOORE, M., The Longitude Man, 189
Moreton Bay, 17, 176

Nedlloyd Tasman, 112
Norna, 67
Northern Passages, The, 32
Notices to Marine Observers:
  Change of HQ telephone number, 95
  Facsimile charts from Bracknell, 137
  Part 4 of the Atlantic Weather Bulletin discontinued, 95
  Port Meteorological Office in Southampton, 45
  Port Meteorological Officer — change of address, 96

Obituaries:
  BOLD, R., 200
  COX, D., 201
  HIRST, A., 200
  KIELTHY, K., 201
Obs ode again, 126
OOCL Challenge, 13, 116
Oriental Bay, 175
Ormond, 66

Pacific Sandpiper, 115
Pacific Teal, 56
Parachute, Western North Pacific, 69
Peninsular Bay, 168
Photographs:
  Beaver, 44
  BRITAIN, CAPT. A., 195
  Cable Restorer, 93
  Chronometers, Marine, 191
  Cloud, 86, 129
  Commission for Marine Meteorology, 165
  Cumulonimbus, 187
  DOWNES, CAPT. C.R., 194
  ERS-1 Satellite image, 31
  Falcon, 173
  Flinders Bay, 99
  Frigatebird, 38
  HARRISON, CAPT. P.P.O., 135
  Icebergs, 58
  Illuminated sky, 38, 187
  MACKIE, CAPT. G.V., 163
  McWHAN, CAPT. D.R., 124
  Moth, 127, 130
  NORWELL, CAPT. S.M., 123
  Plankton bloom, 86
  Presentation of barographs, 34, 35, 36, 37, 85
  Red-spotted Bluethroat, 86
  Roll cloud, 83
  Salmon fishing, Bay of Fundy, 78
  Satellite image of ice, 185, 188
  Tide-gauge at Newlyn, 81
  West Moor, 99
  Whimbrel, 62
  White stork, 128
  Wiltshire, 99
Port Met. Officers, Meet the, 122, 193
Port Met. Officers overseas, 203
Pressure gradients in the North Pacific, 196
Providence Bay, 63

Queen Elizabeth 2, 61
Queensland Star, 7

Radar echoes:
  Caribbean Sea, 9
  Equatorial Atlantic, 111
Radio reception, Indian Ocean, 19
Ravenscraig, 59
Regina Oldendorff, 107
Resolution Bay, 112
Retirements:
  GORDON, CAPT. F.K., 201
  ROBERTSON, CAPT. G.J., 95
  WILSON, CAPT. W.A., 201

Sachem, 6
Seals, 172
Seniority, 18
Severe tropical storm 'Fran', Coral Sea, 6
SHAW, I., Record North Atlantic Low, 120
Smeaton, John, Civil Engineer, 117
Space debris:
  Skagerrak, 177
  Western Mediterranean, 176
Squall, Passsage of, North Sea, 108

Taunton, 170
Telnes, 113
Tides, their origins and behaviour, 71
Tribute: CAPTAIN P.P.O. HARRISON, 134
Tricuda, 169
Tropical storm 'Janis', East China Sea, 107
Turtle, Southern Indian Ocean, 13
Typhoon 'Bobbie', Western North Pacific, 56

Unidentified light, Caribbean Sea, 69

Waterspout, Indian Ocean, 57
WATSON, M. and P.J. HERRING, Milky Seas: a Bioluminescent Puzzle, 22
Winds, Suez Canal, 8

Zidona, 69

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